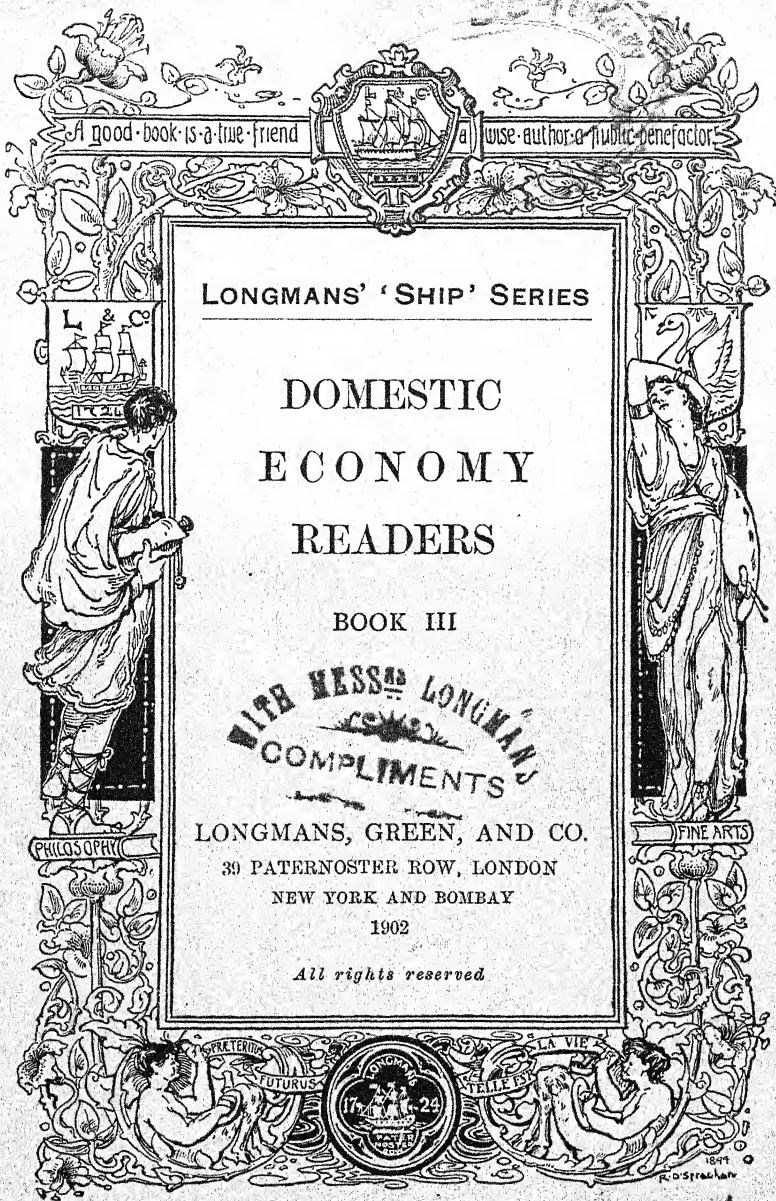




"WHAT A HAPPY FAMILY YOU HAVE HERE" (see p. 21)



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DOMESTIC
ECONOMY
READERS

BOOK III

WITH MESSRS LONGMANS
COMPLIMENTS

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LONGMANS' SHIP SERIES

DOMESTIC ECONOMY READERS

BOOK III

LESSON I.

A STITCH IN TIME.

tire'-some	ex-claim'-ed	wasn't=was not	extra=more
stitch	calf-tongue	re-pair'-ing	than usual
re-join'-ed	con-sent'	diff'-er-ence	sew'-ing
wrapped	vis'-it-ors	sciss'-ors	aw-ry'

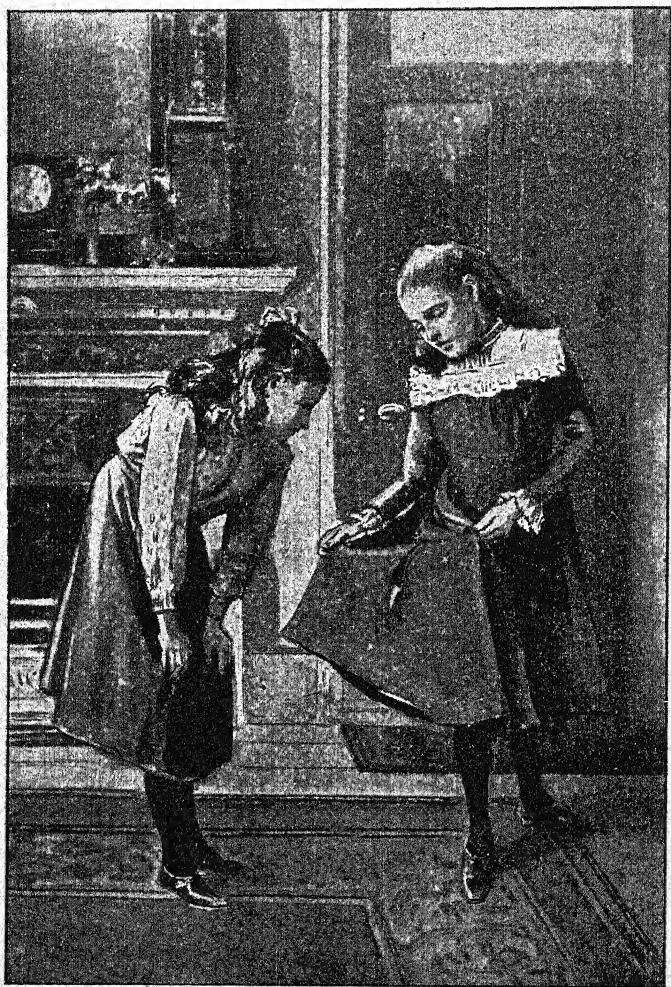
1. "Oh dear, how tiresome," Clara Moore exclaimed. "What is the matter?" asked her friend, Daisy Evans.

"Matter! Just look how I've torn my dress; it wasn't my fault either. I didn't push the desk awry."

2. "I'm sorry your dress has been torn, but you must own, Clara," said Miss Lowe, "that there was plenty of room for you to pass without danger to your clothes, if you had looked where you were going."

"I'm afraid I am more to blame than I at first thought I was," said Clara. "I ought to have been extra careful, because there was a little tear where the big one is now."

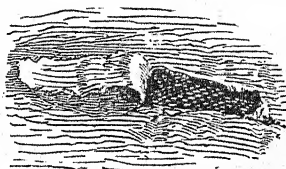
3. "Ah!" said Miss Lowe, "I see you have



"JUST LOOK HOW I'VE TORN MY DRESS"

not yet learned that 'A stitch in time saves nine.'"

"The worst of it is," said Clara to Daisy, "I know mother will say I must mend this myself after tea. Last week I caught my jacket sleeve on a nail, and made a calf-tongue slit in the cloth. Mother was a long time mending it, and she said that I must begin to learn how to mend my own clothes the very next time that something wanted repairing.



A CALF-TONGUE SLIT

4. "Now here is this great slit, just on a lovely evening when I meant to enjoy myself out of doors with you and Mab."

"I am sure we shall not enjoy ourselves without you," Daisy said. "Let us put off our walk till the next fine evening. We can bring our sewing and sit with you if you like."

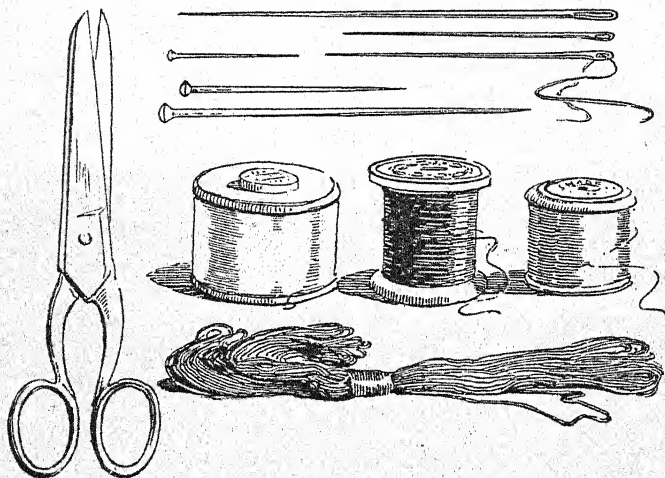
"That's very kind of you," Clara rejoined. "I will ask mother about it."

5. Mrs. Moore gave her consent to this plan, "but," said she, "it will have to be a real working evening for Clara; she will perhaps be careful when she has to patch her own torn things, and more careful still when she knows the difference between mending a little hole and a big one."

Mrs. Moore always carefully wrapped up and put away in a drawer pieces of stuff left

over after dressmaking. She knew that they would be wanted for repairs.

6. While she went to find the pieces like her child's frock, Clara placed chairs for her visitors, her mother and herself. She also fetched the work-basket, in which there were scissors, sewing cottons and silks, needles and pins.



LESSON II.

PATCHES AND THIMBLES.

thimb'le	holl'ows	ridg'es	queer
thumb'bell	ac-cord'ing	ex-cuse'	list'en-ed
watch'-ed	weight	weav'ing	pat'-tern
creas'es	de-scrip'-tion	beau'-ti-ful-ly	splen'-did-ly

1. "Let me see," Clara thought to herself, "I shall want my thimble. I wonder where it is. Most likely at the very bottom of my pocket.

“Oh yes, here it is.

“What a funny little thing you are, all covered with hollows outside, but smooth within,” Clara said to the thimble as she popped her middle finger into it. “You are so useful too. Even if my needle slips over your ridges you catch it on your rim.



A THIMBLE

It does seem queer that thimble means thumb-bell, but I know how that comes about, for Miss Lowe told us that people used to push the needle through work with the thumb, and then a thimble *was* a thumb-bell.

2. “How cheap you are too. How could you be made and sold for a farthing? True, you are not real silver like the one mother wears, but you looked very much like it when you were new; no wonder Miss Lowe says there is no excuse for a girl in our class to be without a thimble.”

It did not take long to think all this, and Clara might have gone on thinking more, but her mother was ready to begin work, and Daisy and Mabel came.

3. All the children listened and watched while Mrs. Moore showed Clara how to place the patch the right way according to the weaving and according to the pattern.

It seemed easy enough till Clara took it

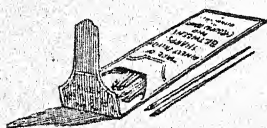
into her own hands, and then the dress would not lie flat, creases came where they were not wanted, and the patch wouldn't match at all.

4. "Oh dear! what shall I do?" the child said.

"Begin again," replied her mother, placing the dress on the table so that it was not drawn down by its own weight. Then the patch was fixed in its place with a few pins, and the rest became easy.

"Shall I want a long or a short needle, mother?"

"One of middle size will be right—a number 6 or a number 7 will do, both for length and thickness."



A PACKET OF NEEDLES

5. As Clara seemed to be working nicely at her patch, and her friends at their dolls' clothes, Mrs. Moore said, "Have you ever thought what a beautiful thing a needle is?"

"Beautiful, mother; did you say beautiful?"

"Yes, dear; is it not beautifully round, beautifully tapering, beautifully sharp, and beautifully smooth, beautifully bright, and splendidly useful?"

While laughing at this description of a needle, they all agreed that its praises were well deserved.

LESSON III.

ABOUT NEEDLES.

some'-thing	fin'-ish-ed	troub'-le	diff'-er-ent
per-haps'	Chi-nese'	Eng'-lish	per-fec'-tion
sur-pris'-ed	fac'-tor-y	Span'-iard	se'-par-ate
la'-bour	pa'-tient-ly	Ger'-man	gauges

1. "Can you tell us something more about needles, Mrs. Moore?" asked Daisy.

"Yes, child, I can, for I lived amongst needle-makers, and have seen them at work. I have also read about needles.

"You all admit that they are beautiful little tools to sew with, so you will perhaps not be surprised to find that a great deal of labour has been spent on them to make them what they are.

2. "In former times, needles were made by hand, and each one would be begun and finished by a very few pairs of hands. The Chinese claim to be the first steel needle-makers. Even now there is a factory in China where needles are made by hand.

"Very patiently a man will rub a steel bar as fine as he wants it to be, and afterwards make it into needles with great cost of time and trouble.

3. "The first English needles were made and sold in London by a Spaniard who would not tell any one how he did his work. When he died, people could get no more needles for a long time, and any one who owned a needle was thought well off; but in the reign of Queen Elizabeth, some German needle-makers settled in London, and ever since then needle-making has been carried on in England, and now English-made needles are used throughout the world.

4. "The chief needle-making towns are Redditch, Alcester, and Studley.

"It was in Redditch you lived, wasn't it, mother?"

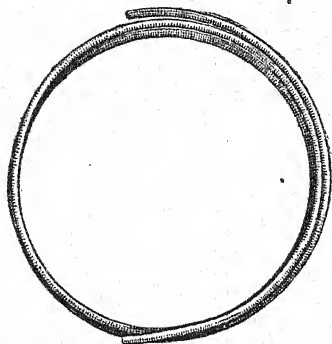
"Yes, Clara; and those are Redditch needles you are using. It is said that every needle passes through the hands of about twenty-two different workpeople before it is ready for the shop."

5. "Oh, what a number!" exclaimed Daisy. "I wonder what they all do."

"By working one after another they all help to bring the needle to perfection," said Mrs. Moore; "but I can only tell you now what the chief steps in the making of a needle are.

6. "Nowadays, wire-making is a separate trade, so the needle-maker buys rolls of needle

wire of different thicknesses, according to the sizes of the needles he is going to make."



ROLL OF NEEDLE-WIRE

LESSON IV.

NEEDLE-MAKING.

straight'-en-ed	ham'-mer-ed	trim'-ming	hard'-en-ed
grind'-stone	pier'-ced	bus'-i-ness	thread'-ed
lengths	punch'-ed	pa'-tient	grooves
dan'-ger-ous	bulge	ef'-fort	rough'-ness

1. "The roll of needle-wire is cut into lengths, each long enough for two needles.

"Next, each length being slightly curved, must be *straightened*. From ten to fifteen thousand lengths are made red-hot, and then rubbed between a flat iron table and an iron bar.

2. "The straight steel rods are next *pointed* at each end on a grindstone. Pointing used to be very dangerous work. Fine powder from the steel and the grindstone made its way into the lungs of the workmen, and soon



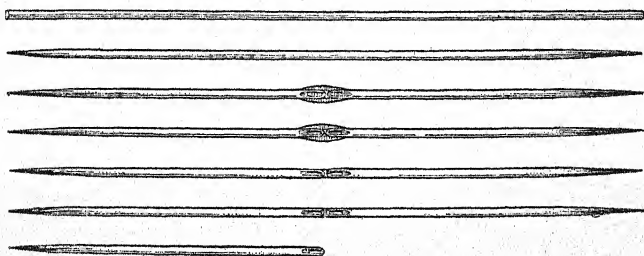
A NEEDLE-POINTER AT WORK

caused death; but fans are now so placed that the deadly dust is blown away from the needle-pointer.

3. "Each length is *hammered flat* with a

single blow from a stamping press worked by machinery. The same blow stamps the impression of two heads and eyes on the middle of the wire on both sides.

4. "We should not be able to thread the needle yet because it has not yet any eye,



NEEDLES IN VARIOUS STAGES OF MANUFACTURE

though we can see where the eye is to be made.

5. "The next step is to make the eyes. This is done by means of a punch that pierces right through the half-formed head.

6. "The eye of the needle must now be very nicely *cleared*, and very careful workpeople do this. Many years of patient effort taught needle-makers to clear the eyes so that the thread could be used without being frayed."

7. "And is clearing a secret?" asked Daisy.
"Oh no. I will tell you how it is done,"

replied Mrs. Moore. "A very fine steel wire is hardened, and made slightly rough; about a hundred needles are threaded on this fine, hard file, and are shaken very rapidly.

"By this means the rough inside edges of the eye are worn away.

8. "By this time needles are right in size, shape, and trimming, but they are not yet good tempered. They would stick in the stuff as if saying 'we won't work,' and if you pushed a little harder they would bend rather than go through."

"Why do they stick fast or bend, mother?"

"Because they are not smooth enough, and the steel is too soft."

LESSON V.

NEEDLE-MAKING—*continued.*

temp'-er-ing	plung'-ed	fin'-ish-ed	lus'-tre
sud'-den	cool'-ed	em-ploy'-ed	finger's
un-temp'-er-ed	pol'-ish-ed	en'-ter-ed	un-seen'
fur'-nace	em'-er-y	straight	roll'-ed

1. "The next thing to do to needles is to give them the right amount of hardness. This is called *hardening and tempering*. Great heat

and sudden cooling makes soft steel into hard steel, so our untempered needles are made white-hot in a furnace, and then plunged into cold oil. Being then too hard and too easily broken, they are made right by being heated again and cooled slowly.

2. "When needles are of the right temper they are ready to be *polished*."

"I shouldn't like to polish needles, mother; I should prick my finger too often, or else leave a bit at the points undone."

"That wouldn't do, Clara; needles must be polished perfectly, or they will be useless. But they are not polished by hand. Bundles of about fifty thousand in each are put in a bag along with emery powder and oil, and then rolled under a heavy weight. They come out of the bag smooth and bright.

"The *making* of the needle is now finished, but yet many hands must be employed before needles reach shops and houses."

3. "What a happy family you have here," said Aunt Jane, as she entered the room with her brother, Mr. Moore. "You are all sewing, I see."

"Yes," Mrs. Moore replied. "Clara is mending her frock for the first time."

4. "I well remember the first time I mended a frock," Auntie said. "My mother gave me

a needle and I have it yet, though it is forty years ago."

"How could you keep it so long? Is it very rusty, Aunt?"

5. "Is it rusty?" asked Auntie, as she proudly drew from her pocket-case as bright and as straight a needle as any one could see.

"It might have been rusty, if I had put it out of sight and out of mind, but I have often used it since I had it. You know the old sayings—'Sloth rusts faster than labour wears,' and 'The used key is always bright.' In this case it is the used needle that has kept its lustre.

"I should not like to lose or break it now. Very likely it is the oldest needle in the town."

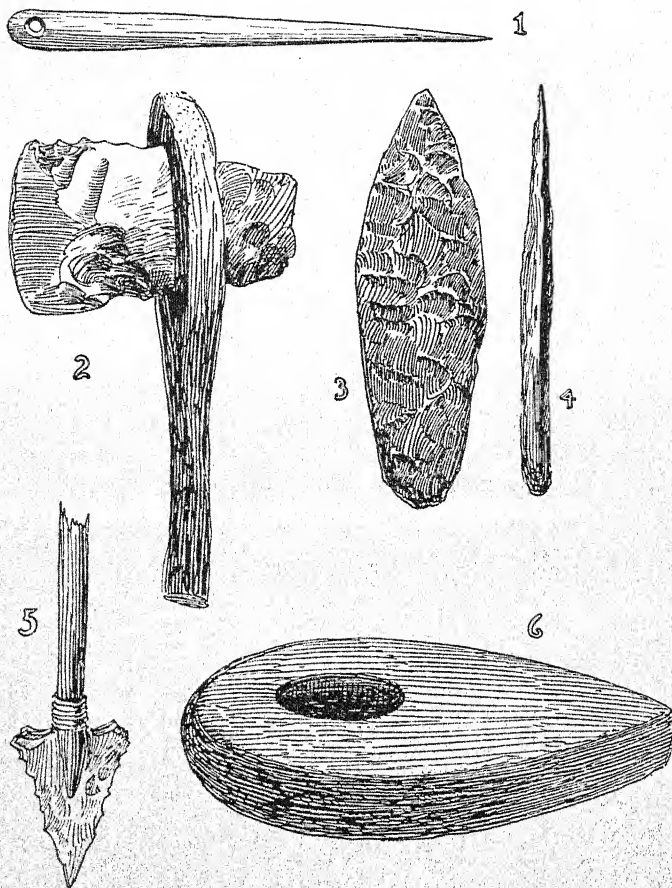
LESSON VI.

THE OLDEST NEEDLE.

ex-claim'-ed	ex-change'	clothes	met'-als
flint-stone	hun'-dreds	won'-der	chop'-ping
man'-ag-ed	suit'-a-ble	re-pli'-ed	scrap'-ing
im-prove'-ments	cer'-tain-ly	sin'-ew	chase

1. "Nay, nay, Aunt Jane," said Mr. Moore, "I can show you a needle much older than

yours. My needle was made thousands of years ago. I keep it in a safe place, you may depend."



- | | | |
|---------------------------|---------------------------|---------------------------|
| 1. Bone needle. | 2. Flint celt or hatchet. | 3. Stone knife—flat side. |
| 4. Stone knife—thin side. | 5. A flint arrow head. | 6. Perforated stone axe. |

All were eager to see inside the case which Mr. Moore fetched from his desk.

2. "Is that a needle?" exclaimed Clara. "Why, it looks like a stone."

"It is a stone," her father said, "a flint stone needle. See, here is its eye, and here its point. Notice, too, its smooth sides. The man who first managed to shape and smooth a stone, and drill an eye at one end, was a very clever person in those times. He made a tool from which our needles have grown, as it were, by improvements from time to time."

3. "I would not change my beautiful steel needle for your stone one, father."

"Perhaps not, and I would not exchange my one flint needle for hundreds of yours. Yours are very suitable for your work, but I keep mine for the sake of what it used to do."

4. "What could a needle like that do?" asked Daisy. "It would make great holes in the stuff."

"It certainly helped to make the clothes worn by people who lived long, long ago."

5. "I wonder what sort of cotton they threaded in this big eye," said Mabel.

"Ah, my child," replied Mr. Moore, "this needle never knew the touch of cotton. What it did carry was a narrow strip of skin, or a twisted sinew from animals killed in the chase."

6. "I never heard of a stone needle before," said Daisy. "Why didn't they use steel needles?"

"My dear, when stone needles were made, nothing was known about metals of any sort. At this time, all cutting, chopping, scraping, and piercing tools were made of stone.

7. "When you are old enough, children, I hope you will read in books what a stone needle, or knife, helps to tell us of the way men and women lived, what kind of homes they had, and how they hunted and fished for food, and dressed themselves in the skins of the animals they killed.

"I will now put my precious old needle safely away again."

LESSON VII.

WHY WE WEAR CLOTHES.

an'i-mal

hor'rid

al-to-geth'er

diff'er-ent-ly

ap-pear'-ance

con-sid'-er-ed

coun'-tries

pro-tec'-tion

weath'-er

ex-am'-ple

un-cloth'-ed

scratch'-ed

pier'-ced

black'-ber-ries

goose'-ber-ries

scorch'-ed

pre-par'-ed

scrap'-ers

1. "I'm glad we have nicer things to wear now," said Clara, smoothing her own pretty woollen dress. "If I had lived when nothing but horrid skins from dead animals were

worn, I had rather have been without clothes altogether."

"Think again, Clara, and you will think differently. You would have been glad of a covering even if it were only an animal's skin, when the biting frosts came, or the North-East winds blew."

2. "**Appearance** is not everything, though it must of course be considered."

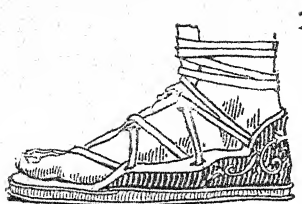
"I never thought of the cold, mother, but there are countries where frost never comes."

"Even there you would not be better off," said Aunt Jane. "I am pretty certain you would want some covering from the burning sun or heavy rains; in fact, we want **protection from weather** of all kinds."

3. "Besides these two good reasons there are others. Which of you, for example, would like to make your way unclothed over marshy or stony ground, or through forests or shrubs?"

"If we tried to do so," said Daisy, "I expect our bodies and feet would be cut and scratched; besides, thorns would pierce us and stinging insects would hurt us. It is bad enough to be scratched on the hands when we gather blackberries, or wild roses, or pick gooseberries."

"Yes," Auntie replied, "we wear clothing as a **protection from injuries**."



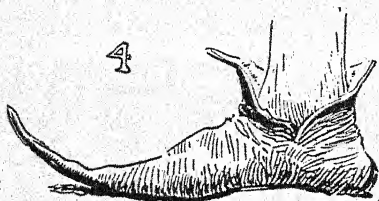
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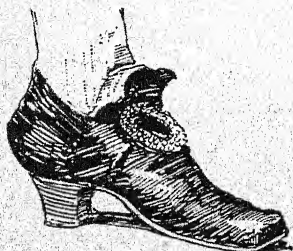
2



3



4



6



5

THE DEVELOPMENT OF FOOT-COVERINGS

1. Roman sandal.
2. Roman buskin.
3. Indian moccasin.
4. Pointed shoe (fourteenth century).
5. Military boot (eighteenth century).
6. Shoe (eighteenth century).

4. "Mother," said Clara, "I've changed my mind. I am sure I would sooner wear skins than be frozen or scorched to death, or scratched and cut and stung about the body."

"Even in those days," said Mrs. Moore, "skins were not worn just as they came from a dead animal; they were prepared for use. With stone scrapers the fleshy parts were removed. The sun and wind dried the skins, after which a good deal of fat and marrow were rubbed in with smooth, rounded stones, and thus the cured skins were softened to suit the human body."

5. "Not so bad, after all," said Auntie; "though I don't suppose they were as warm and soft and cosy as the jackets, muffs, furs and other skin clothes we wear now."

"The very best of reasons why we wear clothes," said Mrs. Moore, "comes last."

6. **"Clothes keep our own bodily heat near to us."**

"What does that mean, mother?"

"It means too much for me to explain to-night. You don't know what good stoves your bodies are."

"Daisy and Mabel shall come again soon, and we will talk about it; but now say 'Good-night,' for it is time little folks were at home."

LESSON VIII.

BODILY HEAT. PART I.

chat-ter	whis-per-ed	fu-el	stok'-ing
cous'-ins	sur-pris'-ed	mer'-ri-ly	act'-ing
ac-cept'	won'-der-ing	sup-plied'	en'-gines
in-vi-ta'-tion	pleas'-ant-ly	sense	breathe

1. "My cousins, Alice and Mary, are coming to tea to-day, and mother told me to ask you and Mabel to come too," Clara said one morning to Daisy. "Father and Harry will be at home as well. There will be no mending of clothes to do to-night. Mother says she expects it will be a chatter party."

"We shall be ever so glad to come, and I am sure mother will let us accept your kind invitation," Daisy answered.

2. At tea-time Mrs. Moore said: "I told these little girls something about themselves last time they were here. Have you forgotten what it was, my dears?"

Mabel whispered, "You said we were stove pipes."

Alice and Mary looked up surprised, but Daisy said, "It wasn't quite like that; but Mrs. Moore did tell us that our bodies were good little stoves, and we have been wondering about it ever since."

3. "And now we are all stoking," said

Harry; "but this is more pleasant work than stoking for engines, isn't it, Clara?"

"I don't know what you mean," Clara rejoined.

"Well," said Harry, "stoking is mending fires, and the man who shovels coal and coke into the fire which keeps the engine moving has very hot, tiring, dirty work to do. But here we are, easily and pleasantly mending our fires."

4. "We are not mending fires, we are getting our teas," said Alice.

"Exactly so. Have a little more bread and butter, Alice, or will you take cake, just to keep your stove going merrily? You can't keep up fires without fuel, you know."

"How queerly you are talking, Harry," said Clara. "Please, father, tell us yourself what he means."

5. "Very well, Clara. You know that stoves are places where heat is made by the burning of fuel, and if the heat is to be kept up, fuel must be supplied as it is wanted. Well, Harry means that, in this sense, our bodies are stoves, because heat is made within us by the air we breathe acting upon the food we eat.

"When he says we are stoking, he means that we are keeping up our bodily heat by taking in a fresh supply of food to be burnt up."

LESSON IX.

BODILY HEAT. PART II.

nei'-ther	coun'-tries	wheth'-er	air-tight
warmth	u'-su-al	meas'-ur-er	trav'-els
mar'-vel-lous	fierce'-ly	quick'-sil-ver	de-grees'
frost'-bound	doc'-tor	mer'-cu-ry	sil'-ver-y

1. "Does food catch fire in our bodies?" asked Mary.

"Not as coal, or wood, burns in a grate," replied her uncle. "Yet our food slowly and surely burns away within us with a steady heat without a flame, and let me tell you that if you were not warmed from within you would not be warm at all.

2. "Neither the thickest blanket, nor the best skin you could buy, would make you warm if your stoves ceased to work.

"We have a truly marvellous fire within us that keeps our blood at a steady level of heat night and day, winter and summer, in icy frost-bound lands, and in countries under a burning sun."

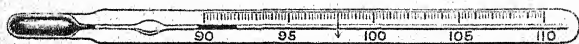
3. "But, father, I'm hotter sometimes than I am at others," said Clara.

"It may happen that you feel more heat sometimes, because you do something which sends your blood to the skin quicker than usual, or you may catch the warmth of the

fire, or of the sun, but your blood heat will not be much changed. If your bodily fire should really burn fiercely, or go a little too low, we should have to call in the doctor to cure you of a dangerous illness."

4. After tea Mary said to her uncle, "I want to know two things. Can you tell us how hot our blood is, and whether we are all alike?"

Mr. Moore took a small glass tube from his pocket. "This is a heat measurer," he said.



A CLINICAL THERMOMETER
(To measure the heat of the body)

"See, there is a little bulb of quicksilver, or mercury, at one end of an air-tight tube."

5. "How does it work, father?"

"When quicksilver is warmed it swells out, and is forced up the tube. The lines on the glass show how far it travels, and the numbers tell how much heat sent it on its way."

6. "Heat is measured by degrees, not by pints or inches."

"The silvery line is now at No. 65, and this tells us that there are 65 degrees of heat in the air of this room."

LESSON X.

BLOOD HEAT.

tongue	an'-swer-ed	laugh'-ing	fad'-ed
re-mov'-ed	meas'-ur-ed	child'-ren	doesn't= does
per-haps'	who-ev'-er	en-joy'-ed	not
be-yond'	star'-ing	day'-light	re-join'-ed
hast'-en	re-mem'-ber	ar-riv'-ed	

1. "Now, Mary, let us measure your heat. Put this tube just under your tongue for a while. That is the warmest nook in your body in which it can be placed."

When Mr. Moore removed the measure the silver line had reached No. 98, but it soon began to go down again, when out of the mouth. Then Alice tried. She too measured 98 degrees. So did each of the other girls, and Harry.

2. "Perhaps it won't go any higher," Daisy said.

"Let us prove it," said Mr. Moore, placing the tube into a cup of hot water. Then the girls saw the silvery thread hasten along much beyond No. 98.

"Your two questions are answered, Mary, are they not? We have measured bodily heat, and found that it is 98 degrees, and as each of you brought it up to the same point, you must be all alike.

3. "Now, Harry, I want you to come with me," said his father.

Soon afterwards the girls went into the garden. "Whoever is that strange-looking man?" said Daisy in a startled voice.

All turned towards the spot she was staring at. Then Clara began to laugh.

4. "It's Harry's doings," she said. "I'm sure it is his joke. You remember the old stone man, don't you, Alice?"

"Oh yes, doesn't he look queer in uncle's cap and auntie's fur cape, and the rug around him?"

5. "He won't hurt you," said a voice from behind, and there stood Mr. Moore and Harry. "Poor old chap, we thought we would put some warm clothing on him. Go and feel how warm he is now, children," said Mr. Moore.

6. "Oh, we know he is as cold as ever he was, which only shows that clothes are not warm at all," said Alice.

"But they keep our own bodily heat near to us," more than one voice replied.

After this, the children enjoyed some good out-of-door games till daylight faded and supper time arrived.

LESSON XI.

HEAT AND HEAT MOVEMENTS.

hung'-ry	re-ceive'	our-selves'	easy-ly
thirst'-y	re-fuse'	sour'-ces	car'-ri-ers
bis'-cuits	with'-er	sup-ply'	con-duct'-ors
ming'-les	cer'-tain-ly	move'-ments	touch'-es

1. "Here you come," said Mrs. Moore, "hungry and thirsty, I dare say. Well, there are biscuits and buns, and hot milk, enough for all."

"Where is the milk, mother?"



TEAPOT AND COSY

"I put it under the cosy to keep the heat from flying away."

2. "Where does heat fly to?" asked Mabel.

"It mingles with the air, or passes into anything that will receive it, and there are not many things in this world that refuse to carry heat."

"Heat, you know, is one of those things

we can feel but cannot see, and though we often trace where it is by what it does, we cannot catch it and keep it. It *will* go away."

3. "I wonder where it comes from, and how it comes," said Alice. "Perhaps heat is like the wind, as the old song says:—

'Whither it comes or whither it goes
There's no one can tell you, there's no one
that knows.'"

"I know," said Mary, "heat comes from the sun."

"It also comes from burning coal, and things we make fire of," said Daisy.

4. "And we certainly make some for ourselves," added Clara.

"You are right, girls," said Mrs. Moore, "for **sun heat, fire heat, and bodily heat** are our chief sources of supply; but as to *how* it comes and goes, I can tell you this much: it flies without wings, for it passes through air; it swims without fins, for it is in all waters; it runs without feet upon the face of the earth, and it pushes itself without hands into everything it touches.

5. "But the proper words* for these movements are too hard for you on a party night,

* See Summary at end of book.

though I must tell you that when heat pushes itself into things it finds some that are far more willing to receive it than others, and those things that take heat in easily just as easily let it out, while those that get hot slowly keep the heat they take as long as ever they can.

"The quick carriers are said to be '**Good conductors of heat,**' the slow carriers are '**Bad conductors.**'"

LESSON XII.

THE MAGIC LANTERN. PART I.

con-duct'-or	a-wait'-ing	scenes	chew'-ing
men'-tion-ing	mag'-ic	pict'-ures	trad'-ers
trans'-port	lan'-tern	glimpse	val'-u-a-ble
kitch'-en	low'-er-ed	muf'-fled	fur-bear-ers

1. "Did I hear you say, 'Here comes the Conductor?'" said Harry, as he joined the group.

"No, my son, I was just mentioning good and bad conductors of heat."

"But I am really a conductor, mother, for I am come to transport you all to the kitchen. Will you follow me?"

2. Off they went, and found a pleasant surprise awaiting them, in the form of a magic lantern.

They were soon seated; the lights were lowered, and a funny picture appeared on the screen.

It would take too long to tell you about all that followed.

Many of the scenes made the children laugh merrily, but even more than the funny slides



AN ESKIMO FAMILY AT HOME

the children seemed to enjoy the pictures of other people and other lands.

3. "We cannot all travel," Mr. Moore said, "so the next best thing is to learn something of the world by pictures and by reading.

"Here is a glimpse of an Eskimo family at home in the frozen north of America. Their

houses are like little snow hills, and they creep in and out through long low passages."

4. "They look snug enough in their fur clothes," said Alice, "but how can they work muffled up in that way?"

"Eskimo women have little or no cooking, house cleaning, or washing to do, and their dresses, once made, last for years, but they spend a good deal of time chewing skins, to make them soft enough to wear or sell to traders.

5. "Eskimo men and boys brave many dangers to catch and kill the animals they want for food and clothing, or for trading.

"Many of these animals are hunted for the sake of their skins, which are valuable not only to the Eskimo, but also to ourselves, for very few fur-bearing animals live in England, yet we like to wear fur jackets, muffs, or boas in winter time."

LESSON XIII.

THE MAGIC LANTERN. PART II.

trap'per	er'mine	Aus-tra'li-an	screen
squaw	Russ'ia	em'broid-er-ed	non'sense
strap'ped	A-mer'i-ca	In'di-an	ban-da-ges
gen'er-al	kan-gar-oo'	Chi-nese'	cramp'ed

1. "I should not like to be an Eskimo," said Mabel.

"How would this suit you then?" asked

Mr. Moore, showing a Red Indian trapper and his squaw with her baby strapped to her back.



A RED INDIAN TRAPPER
AND HIS SQUAW

"Oh no, no, not at all," was the general cry. "They do not look happy and comfortable."

2. "This," said Mr. Moore, changing the

picture, "is a group of fur animals which the Indian trapper catches and sells to fur traders.

"Some of the best ermine, fox, squirrel, sable, and bear furs come from Russia and other countries in Europe and Asia, so the supply does not depend upon America alone.

3. "We really must mention our own humble rabbits and hares amongst the fur



A STOAT OR ERMINE

bearers, for thousands of their skins are used to make warm clothing for people who could not afford more costly furs.

"Now I will show you a picture of something you would have to travel more than ten thousand miles to see," said Mr. Moore.



A FOX

"It is a kangaroo hunt. You can see that the strange creatures are keeping the horses at

full gallop; they themselves bound along in great leaps, using their strong tails to help them to spring.

"The kangaroo is the largest native animal

of Australia, and almost the only fur bearer, except the rabbit of late years."



THE SQUIRREL

4. "I had no idea there were so many animals whose coats we wear," said Clara.

"And yet you have only been shown the chief of those we have to thank for some of our best clothing."

"Uncle," said Alice, "this is a real magic lantern, for it has taken our thoughts like magic from place to place. I wonder where we shall go next?"

"To China," uncle said.

5. "Oh, oh!" the children cried, as a Chinese Court lady appeared on the screen.



A MARTEN

"This lady is dressed in the finest of silk, embroidered in gold and silver, but, poor thing, she cannot walk."

"Why not?" the children asked.

"Because her little lilies are too small," said Harry.

"What nonsense," said Clara.

6. "Oh no, it is quite true," said Mr. Moore. "The feet of Chinese ladies are called lilies when they have been kept small enough to be considered beautiful.

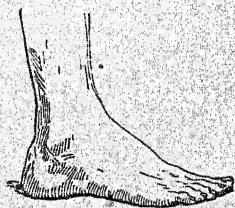
"A wealthy Chinese lady would not like feet she could walk with. She would rather



THE KANGAROO



A CHINESE LADY'S FOOT



A NATURAL FOOT

toddle about a little with some help. Chinese mothers cause the baby foot to be cramped by bandages till it grows more like a stump than anything else."

LESSON XIV.

CLOTHES SHOULD FIT THE BODY.

cru'-el	diff'-er-ent	re-mark'-ed	squeeze
suf'-fer	in-stead'	de-form'	pro'-per-ly
ex-am'-ple	bun'-ions	waste	sweep'-ers
fash'-ion-able	dis-eas'-ed	screen	mer'-maid

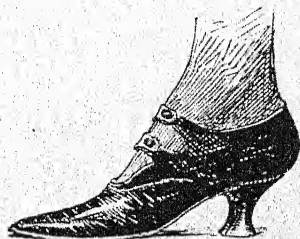
1. "How cruel to serve poor young feet like that," said Daisy. "Oh, what pain the children must suffer."

"Some people who think themselves very wise are almost as foolish as the Chinese," said Mr. Moore.

2. "Look at this, for example. No human



A NATURAL FOOT



A FASHIONABLE SHOE

being was ever born with feet shaped like these, yet thousands of men and women wear,

or have worn, such things because of fashion. People seem to think that feet are made for boots, instead of boots for the feet. No wonder that corns, bunions, diseased joints and ugly feet are often the result."

3. A lovely child, just ready to say "Good-night," next appeared as if by magic on the screen.

"What a sad change it would be for this beautiful child to become the same shape as her Dutch doll," Mrs. Moore remarked. "Yet far too many girls and women try to deform themselves in order to have a small waist. It is much worse to cramp the heart, lungs and liver in steel cages called corsets than it is to bandage the foot, though that is bad."

4. "I should think every one will agree with you, Auntie," said Alice. "Let us resolve, girls, never to squeeze our bodies into shapes which Nature never meant them to take. I am sure we can have pretty and becoming dresses to wear, and yet give our organs plenty of room to do their work."

5. "Let us hope you will also resolve not to turn into mermaids," said Harry. "I saw about a dozen ladies the other day, whose frocks trailed like fish tails, and the ruffles they wore round their necks looked like wavy hair"

"I expect you saw those ladies on a fashion picture," said Clara; "but we are not going to be silly, are we, girls? At least, we won't be street sweepers."

After this a hearty "Good-night" ended a happy day.

LESSON XV.

A FIT OF TEMPER, AND HOW IT ENDED.

chem'ist	grand'fath-er	bus'i-ness	pen'ny-worth
in-tend'ing	tan'ner	know'ledge	plead'ed
ill-hu'mour	la'-bour	phys'ic	hon'est
doubt	a-sham'ed	chem'-is-try	leath'er

1. John Banks was in his bedroom, in a bad temper. There was no doubt about it.

"Why should I learn a trade I don't like? Father knows I want to be a chemist. I used to think he would like it too, but now he tells me I must begin to learn his nasty, dirty trade; but I will not. I'll be a chemist, even if I leave home."

2. With the thought of home and his dear mother and father, John's anger fled, and he was sorry he had given way to it.

"I'll go down and say 'Good-night' in a better tone than I said it when I came upstairs," he thought, and that was how he came to hear his father say: "Aye, mother,

I'm proud of our John; I'm sure he will do something worth doing some day."

3. "And yet you want him to leave off his study, and learn your trade."

"Not a bit of it, my dear, though it is true that I want him to learn my trade. John seems to think the only place in which to be a chemist is a druggist's shop, and because I don't think so too, he has gone off in a bit of a temper; but he's a good lad is our John."

4. "I am very sorry I was in such an ill-humour, father; I could not rest until I had told you and mother so, and without intending to be rude, I have heard a few words of what you were saying. Please forgive my bad temper; I will try and be a good lad."

"That's right, my son; and since you are downstairs, just listen to me.

5. "Your grandfather was a tanner, and so was his father before him. I have been many years master of the work, and should like my son to be a tanner too. Good, honest labour, no one need be ashamed of. You, my boy, want to be a chemist, and I cannot afford to let you spend your life in study, apart from a business. When you took the chemistry prize with honours, I thought, 'John is sure to keep up the study he loves, and

he will bring his knowledge into the tannery, where a good chemist is very much wanted.'

6. "You can learn more about skins and tan and what can be done with them if you work amongst them for a while than in any other way, and perhaps in time the firm of Banks & Son may be noted all over the world as the very best leather makers. But, my son, if you would rather mix physic, and sell pills and powders and pennyworths of stuff——"

"Oh, father, say no more," pleaded John. "I made a great mistake. I am so glad you want me to go on with my studies, and I will do my very best at work, too."

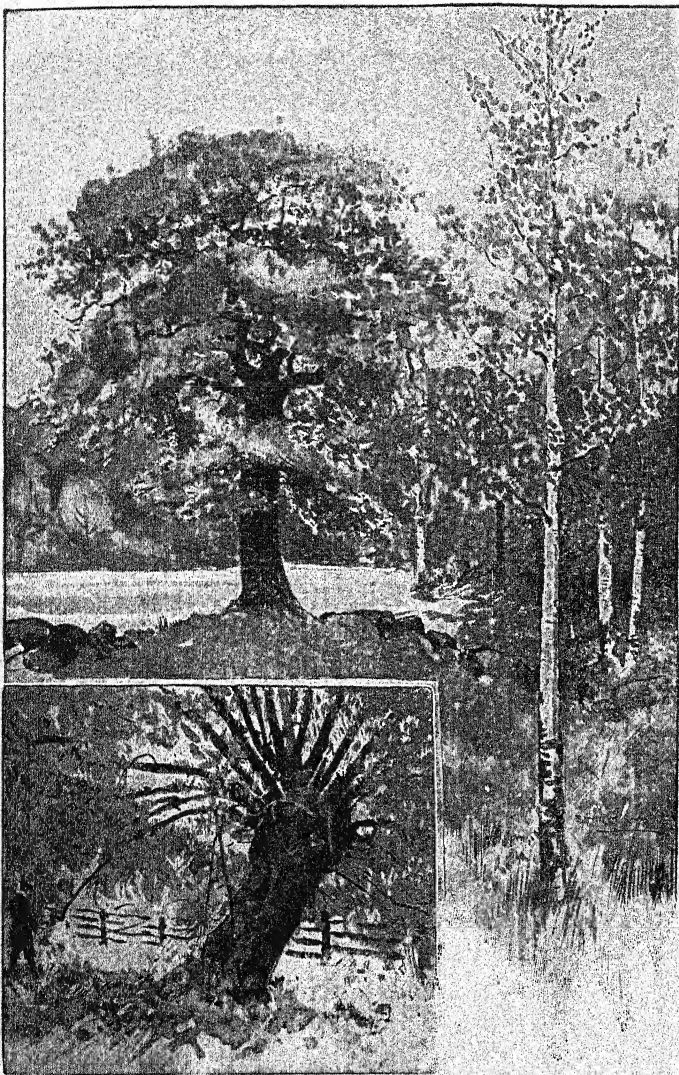
LESSON XVI.

THERE'S NOTHING LIKE LEATHER.

i-de'a	sub'-stance	dur'-a-ble	ful'-fil'
sca'-ly	dis'-solve	ex'-cellent	fail'-ures
gel'-atine	tough	be'-ne-fit	suc'-ceed'-ed
u-ni'-ted	im'-poss'-i-ble	meth'-od	li'-quor
ooze	for'-mer-ly	knight	ob-tain'-ing

1. "Oh, what a business leather-making is! I had no idea there was so much to be done before skins became leather," John said to his father one day.

"Have you found out yet what leather really is, my son?"



OAK

BIRCH

WILLOW

"I think so, for by seeing for myself, and by asking questions, I know that skins are formed in three layers. There is the scaly, hairy layer on the outside and the fatty, fleshy layer on the under side, while a gelatine layer lies between the two. The gelatine layer is the true leather skin, for it is the only part that will unite with the strong acid that comes from oak bark, or tan, as it is called."

2. "Aye, and what a wonderful change takes place when the gelatine and tan have united," said Mr. Banks. "Instead of a soft jelly-like substance that would very soon decay, that will easily dissolve in water, and that is of no use whatever to wear, we have a solid substance which will *not* dissolve in water, and will not let water go through it. Neither will it go bad if kept for any length of time. The new substance will bend easily, yet is very tough and durable to wear. Of course, my boy, you have seen in the works how the tan has to be made to join with the leather skin?"

3. "Yes, father; I was thinking about the tanning itself, and of all that has to be done before and after it, when I said, 'Oh, what a business it is.'"

"And what a time it takes," Mr. Banks

rejoined. "Why, my lad, eighteen months is only just long enough to change a good ox-hide into excellent leather."

4. "I know what I'll do, father"

"What, my son?"

"I'll try hard to find a quicker way of making leather than that."

"If you do, and if the leather is as good as it is now, you will make a fortune for yourself and benefit others too."

5. Did John fulfil his promise? I hear some one ask.

Yes. Years afterwards, through hard work and much study and many trials; some of them failures,* he succeeded in making leather with tan liquor, or ooze, instead of with dry bark, and this method is in use in all large tanneries now.

John also succeeded in obtaining tan acid from willow, birch, and other trees and plants. This gave tanners a larger and cheaper supply of tan stuffs than they had formerly

6. Did John make a fortune?

Yes; he became very wealthy, and was made a knight.

Did Sir John Banks benefit mankind?

Yes. Thousands of people wear leather boots who could not afford to buy them if they

* See Summary of Lesson XVI.

were depending on the old way of tanning leather.

7. Does the new way make *better* leather? No, not *better*, for that would be impossible.

Should you like to know how skins become leather? Read the next lesson.

LESSON XVII.

LEATHER-MAKING.

qual'i-ties	sweat-ing	con-verts'	al-ter'-nate
im-port'-ant	un-hair'-ed	trans-par'-ent	oc-cur'-red
bund'-le	swoil'-en	stretch	pro-cess'
mer'-chant	tan'-nic	soak'-ing	leach'-es

1. Poor skins make poor leathers, so the sorting of skins for different kinds and qualities is a most important thing to begin with.

Let us follow a bundle of good ox-hides from the sorting yard to the leather merchant.

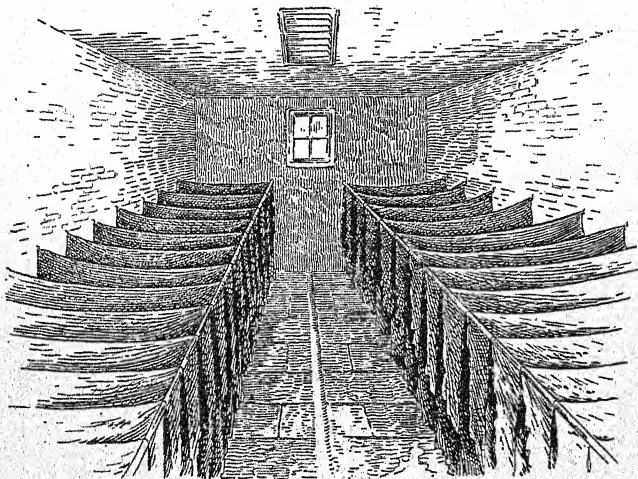
2. First, we shall find them sent to be **sweated**. The pelts, or skins, are hung in rows from four to seven days in a room heated by steam.

After sweating they will be soaked, first in clear water, then in lime water for about three months, when they will be ready to be unhaird.

3. The men who unhair skins stand behind rounded boards, and scrape the pelts downwards with a two-handled knife. They must

be very careful workers or the grained side of the skin will be spoiled.

Another set of men then scrape the undersides cleanly and evenly, and now the true leather skin is ready to be rounded.



SWEATING ROOM

The edges of the pelts and the parts which are only fit for glue-making are cut off and cast aside.

4. **Raising** is making the leather-skin loose and swollen, ready to take into itself the acid which converts it into leather. Properly raised skins are almost transparent; they must be very carefully touched or they will stretch and get thin and out of shape.

After all this has been done **tanning** can really be begun.

5. When John Banks *first* saw tanning done, the tan pits were lined with ground oak bark, and then filled with alternate layers of skin



UNHAIRING SKINS

and bark. The skins were kept in the pit till the goodness of the bark was gone, when they were placed in another pit with fresh bark.

A change occurred about every three months, till the tannic acid was well soaked into every part of the leather-skin, and the whole process took at least eighteen months.

6. When Sir John Banks *last* saw tanning done, his own plans were in use. First, the tannic acid was drawn out of the bark into water in great vats or leaches. The tan liquor is called ooze.

LESSON XVIII.

LEATHER-MAKING—*continued.*

hand'lers	ooze	treat'ment	part'i-cle
re-ceiv'-ed	scour'ing	oil'y	re-quires'
re-move'	pre-vent'	en'ter-ing	cur'rent
li'quor	cyl'in-der	ma-chi'ne-ry	

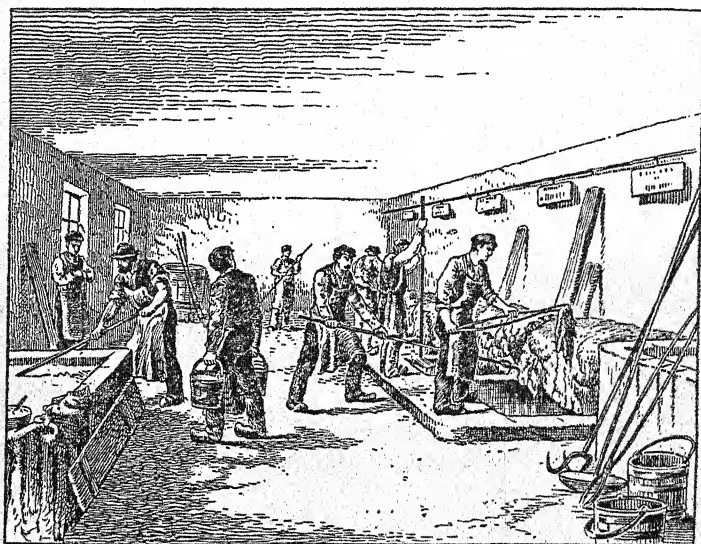
1. A number of pits called "handlers" receive a supply of tan liquor from the leaches. In the first pit the ooze is weak, but in each one after it is a little stronger than the last. The skins are turned over or handled twice a day in the same pit for two or three days; then they are removed to the second handler and served the same, through four or five handlers.

After this the pelts are laid flat and kept from touching each other by a layer of finely-ground tan. This *feeds* the skin with more tannin.

Two days in this pit of dry tan and then the pelts are treated with fresh bark and strong ooze, three times a week in handlers

No. 6 and No. 7. The daily moving of the skins is now stopped.

2. After handling is done, the pelts *rest* in layers of bark and skin, in a pit covered with a layer of bark six inches thick, and



TURNING THE SKINS IN THE "HANDLERS"

filled up with very strong ooze. Here they stay for six weeks, when they are changed to another pit for a further six weeks, and so on for six months. In this time thin skins will be thoroughly tanned, but thick skins will want two or three months longer.

3. After tanning, the pelts (now called

butts) will be **washed** in thin ooze, and brushed to remove every particle of tan. They will then be drained over a wooden horse till dry.

Striking will next be done with a three-cornered, two-handled knife, to remove a bloom which came on while in the tan pits.

The grain side is next **scoured** by rubbing, first with a damp cloth, second with a dry cloth, and thirdly with linseed oil.

4. The oiled butts are taken to a lofty room to be partly dried. Very great care is required in the drying to prevent the sun's rays from entering the room, as the skins must be dried by currents of air, but not by sunshine. When dry enough, the butts are slightly damped and piled in heaps to "samm," or become evenly damp.

5. When thoroughly samm'd the leather is ready to be rolled. Rolling is now done by machinery, which saves much time and labour.

It used to be done by hand on a wooden bed coated with metal, upon which the skin was placed while a man passed a heavy cylinder to and fro over every part of it.

LESSON XIX.

GOING INTO BUSINESS.

silk'-worm	ex-pect'	let'-tuce	east'-ern
rear'-ing	to'-morrow	suc-ceed'	cli'-mate
chick'-ens	green'-ish	mul'-ber-ry	del'-i-cate
for-got'-ten	breathes	south'-ern	

1. "Mother, dear, Daisy and I have agreed to go into business. We have found something that will suit us nicely, and we each have a penny to start with.

"Miss Lowe showed us some silk, which she had seen spun by a worm, and she told us where we could buy silkworm's eggs at twelve a penny.

"With twenty-four worms this season we shall have hundreds next, and thousands the year after, and when we leave school, I expect our silk rearing will take all our time, and we shall do a large trade in selling silk."

2. "Not at all a bad idea, *if* it could be carried out," replied Mrs. Moore.

When Clara met her friend she asked her what her mother said about their plan.

"Oh, mother said, 'Don't count your chickens before they're hatched,' and when I told her I didn't mean chickens at all, she said, 'Well, it's all the same.'



"I THINK," SAID MRS. MOORE, "YOU WILL HAVE SILKWORMS
TO-MORROW"

3. "By that, I suppose, she doesn't think we shall get rich by rearing silkworms."

"Never mind, let us buy the eggs," Clara said, "and hear what mother says when she sees them."

4. "I think," said Mrs. Moore, "you will have silkworms to-morrow morning."

"How can you tell, mother?"

"Because it is the end of May, which is the right time of the year, and because the eggs, which are like pin-heads in shape, are thicker and darker at the edges than in the middle; and because I kept silkworms when I was a girl, and have not forgotten what they taught me. You must have something ready for the little worms to eat; they will be hungry as soon as they are born."

5. "Miss Lowe said they would live on lettuce, and we have plenty of that."

"Ah, yes, it is true they will live on lettuce," said Mrs. Moore, but her tone was not hopeful.

"Mother, you don't seem to think that we shall succeed in our silk business."

"You are right, Clara, and I will tell you why. In its native home, in China, the silkworm lives its short life on the branches of white mulberry trees, whose leaves are its proper food. It breathes the warm air of

the sunny Eastern climate, and the same warm breezes keep it in health.

6. "The silkworm is a very delicate creature, likely to die before its life's work is done; if it gets cold, or if it is kept in close rooms. Even in Italy and Southern France, great care has to be taken to place the caterpillars so that they can get plenty of air without draught.

7. "England is too cold and too damp, and there are not enough mulberry trees growing here, and it would be useless to expect best silk from lettuce-fed worms.

"Still I am glad you bought the eggs; you can be partners this year and learn something from your little stock."

LESSON XX.

HATCHING AND FEEDING.

draught	en-tire'ly	laugh'ing	cer'tain-ly
cat'er-pill-ar	min'ute	hope'full-y	sur-pris'-ed
part'ners	troub'-led	yes'-ter-day	hatch'-ed
at-ten'tion	un-dis-turb'-ed	diff'er-ent	a-larm'

1. "The worms will want a great deal of attention; if they are here, I dare say I can help you.

"First let us provide for them a couple of shallow box-lids, as living rooms."

2. "Oh, Mrs. Moore, mine can go with Clara's; I shall not want to separate them."

"That is all right, Daisy, but still two rooms are wanted. They will first live in one and then in the other, so that the food they have left uneaten, and the air that reaches them, may be entirely changed at least twice a day."

3. "You are not a minute too soon," said Harry Moore to Daisy next morning. "Here are a few little bits of black thread 'All alive O,' every one of them ready to eat more than their own weight in green stuff."

"How shall we get them on to the lettuce?" asked Clara.

"Never lift them by hand," said Mrs. Moore, showing the children how the worms would cling to a smooth-pointed stick, and could then be carried to their food.

4. At first the little mouths were too small to bite holes, but in a day or two the leaves were nibbled just as if a pair of scissors had been at work cutting round holes into them. In four days, the little black threads had grown into fat, big, green grubs.

On the morning of the fifth day, Clara gave the silkworms their breakfast, but when Daisy came to attend to their evening meal,



"NEVER LIFT THEM BY HAND"

both the girls were troubled to see that very little had been eaten.

5. "Are they going to die? Are they ill?" were the questions asked in tones of alarm.

"I cannot tell," Mrs. Moore replied, "whether all will get through their trouble and live. You are right in thinking they are not feeling very well. It will be better to leave them unfed, and undisturbed to-night."

6. Clara's laughing face was the first thing that Daisy and Mab saw when they called next morning.

"Are they better?" asked Daisy hopefully.

"Better? Come and see for yourself how well they are, and how fast they are eating," Clara said.

7. "Are these the worms we saw yesterday?" Daisy exclaimed.

"Yes, the self same," Mrs. Moore answered.

"How changed they are," said Daisy. "Why, they have two sorts of legs, some green, and some black."

"So they have had ever since they were hatched, but they show more now," said Mrs. Moore.

8. "I always thought that worms had no legs," Mabel remarked, "but these seem to have plenty."

"That is because silkworms are not true worms ; they are caterpillars. Caterpillars never have less than eight legs, and sometimes they have as many as sixteen. These grubs have three pairs of short, stiff, black legs under the first ring of their bodies, and four pairs of fleshy feet under their lower rings."

9. "There is something on the top of the last ring," said Daisy.

"Yes ; that is a hook, which all silk caterpillars have. It helps them to pass from twig to twig of the mulberry tree."

"I can see some spots down each side," said Clara.

"You will be surprised to know, my dears, that the silkworm breathes through the sides at those places you call spots."

LESSON XXI.

CASTING AND SPINNING.

nat'-ur-al	tinge	wher-ev'-er
stretch'-es	Sat'-ur-day	spin'-ner
glut'-ton	anx'-ious	li'-quid
un-com'-fort-a-ble	vis'-it-ed	ar-rives'
shrinks	be-times'	sub'-stance
thor'-ough-ly	side'-ways	gum'-my

1. "Mother, can you tell us how it is that our worms were so ill yesterday and are now so changed?"

"All is quite natural. I expected it," said Mrs. Moore. "You see the grub eats very fast and grows very fast, but the outer skin does not grow quite so quickly as the body; so it stretches until it can stretch no more, and the little glutton feels very uncomfortable.

2. "It leaves off eating; its body shrinks away from the tight skin, and a new skin is formed. All this happens in a few hours' time, and then the worm, in its new coat, creeps out of its old one. Look in the box-lid and see the cast-off coats they wore yesterday. In a few more days they will 'sleep' and cast their skins again."

"We shall not be so much afraid of losing them next time," said Clara.

"Yet *casting* is a time of great danger to the worm," said her mother. "If they cannot cast thoroughly, they die.

3. "When sixteen days old the worm casts for the third time, and when twenty-two days old the fourth, and last, cast takes place. The worms will be then full-grown, and will be about as big as your little finger, of a creamy white colour.

"On the twenty-sixth day of their lives they will begin to eat less, and take a deeper yellow tinge, and on the thirtieth day they will eat their last meal."

4. "What will happen then, mother?"

"I think you must wait and see, Clara. Take good care of them until they are thirty days old, and then watch."

One fine day at the end of June, Clara said to Daisy, "Our silkworms are thirty days old to-morrow; I'm glad it's Saturday, for I mean to see what happens. Will you watch too?"

"Indeed I will," Daisy replied. "I feel quite anxious."

5. In the morning Daisy had made her visit to Clara betimes.

"Here is one worm ready to show you how silk is made," said Mrs. Moore. "See, it has crept into the corner of its house."

At first it lay very still, then began to move its head to and fro, and sideways.

6. "Is it in pain, mother?"

"No, my dear; but wherever the little spinner places its head, there it carries a shining yellow thread and fixes it."

"Oh yes, yes, I see a lovely golden thread," said Daisy.

7. "Where does the thread come from, mother?"

"The silkworm has within its body organs which make a yellow liquid out of the food it eats, and this it stores up in folding pipes on each side.

"When the proper time arrives both store pipes pour a stream into and through one opening near the mouth."

8. "But silk is not a liquid, else how could we wear it?" said Daisy.

"The silk substance is a liquid when it is within the body of the worm, but as soon as the air gets to it, it changes into a solid gummy thread, very fine, indeed, but strong, and in shape double, like two fingers placed close to each other."

LESSON XXII.

SPINNING.

begin'-ning	in'-sect	strip'-ped	fi'-bres
sev'-er-al	shroud	floss'-y	o'-val
twist'-ed	bur'-ied	rav'-el-led	un'-winds
rib'-bons	co-coon'	al-though'	ma-chin'-e-ry

1. "The silkworm has been at work while we have been talking," said Mrs. Moore, "and here is the beginning of a small ball of silk, and several more worms are ready to spin."

Mrs. Moore twisted some papers into cone-like cups, and placed one spinner in each. In their native state, or where they are cultivated, the worms spin on branches, not in paper cups.

2. "How kind of the silkworm to spin for us," said Mabel.

"My dear, the worm spins for itself; but we take its work to make some of our richest clothing stuffs. Not only silks and satins, but ribbons, velvets and plush are made of the web of this busy worm."

3. "Whatever can the worm want to do with silk?" asked Daisy.

"My child, Nature has told the worm to prepare for very great changes in its life. While these changes are taking place the insect must be very quiet and undisturbed, so it wraps itself round with a mantle of its own making. It begins with the very outside threads, and works closer and closer until it is buried in its own silken shroud, a beautiful oval case, called a cocoon."

4. "Poor thing!" exclaimed Daisy; "I'm sorry it is buried alive."

"But it is not dead, Daisy. When its cocoon is finished, the outer skin of the worm will form a shell within which the inner parts of the creature will alter.

"When we see this inner self again, it will not be in the form of a worm at all. Wait just two little weeks, and you shall see what has become of the worm."

5. At the end of a week Alice and Mary

came, so Mrs. Moore told Clara to bring her friends and she would let them see what was inside a cocoon.

First the flossy, outside threads were stripped off.



"A SINGLE THREAD, FINE AS IT IS, WILL BEAR THE WEIGHT
OF THE COCOON WITH THE WORM INSIDE"

"Is the ravelled thread any good," asked Alice.

"Oh yes, it is made into what is called SPUN SILK. Stockings, undervests, and gloves are made from spun silk, and so is a great deal of the silk lace which looks so pretty.

6. "Now I have come to the best part of the

silk. See, a single thread, fine as it is, will bear the weight of the cocoon with the worm inside."

"There are a great many threads in one cocoon, I should think," said Mary.

"There you make a mistake, my dear. The cocoon is made of a single thread which is one of the longest fibres in the world."

"How long is it, I wonder?" said Daisy.

7. "Some cocoons are longer than others," Mrs. Moore replied, "but the smallest would be about six hundred yards, and the largest might measure fifteen hundred yards.

"Only fancy, almost a mile of silk formed by one small worm, and all without a break. It is because of this that silk can be reeled as soon as it is made. You may try how easily this thread unwinds, but of course silk reelers use proper machinery worked by steam."

LESSON XXIII.

SILK REELING: CHRYSALIS AND MOTH.

nat'-ur-al-ly	touch'-ed	flour'-y	be-long'-ed
ba'-sins	wrigg'-led	cous'-ins	ring'-ed
be-fore'-hand	chrys'-al-is	whis'-per-ed	al-though'
fre'-quent	feather-like	pu'-pa	ac-cord'

1. "Silk reelers slightly twist the threads of two or three cocoons together, and they

pass on the reel as one thread. The basins that you see contain warm soapy water to soften the silk gum and make the unwinding of the cocoons more easy."

"How do the worms like warm soapy water, Auntie?" asked Mary.

"They know nothing about it," said their aunt, "for the insects in the cocoons which go to the reeler are killed beforehand by steam or by heated ovens."

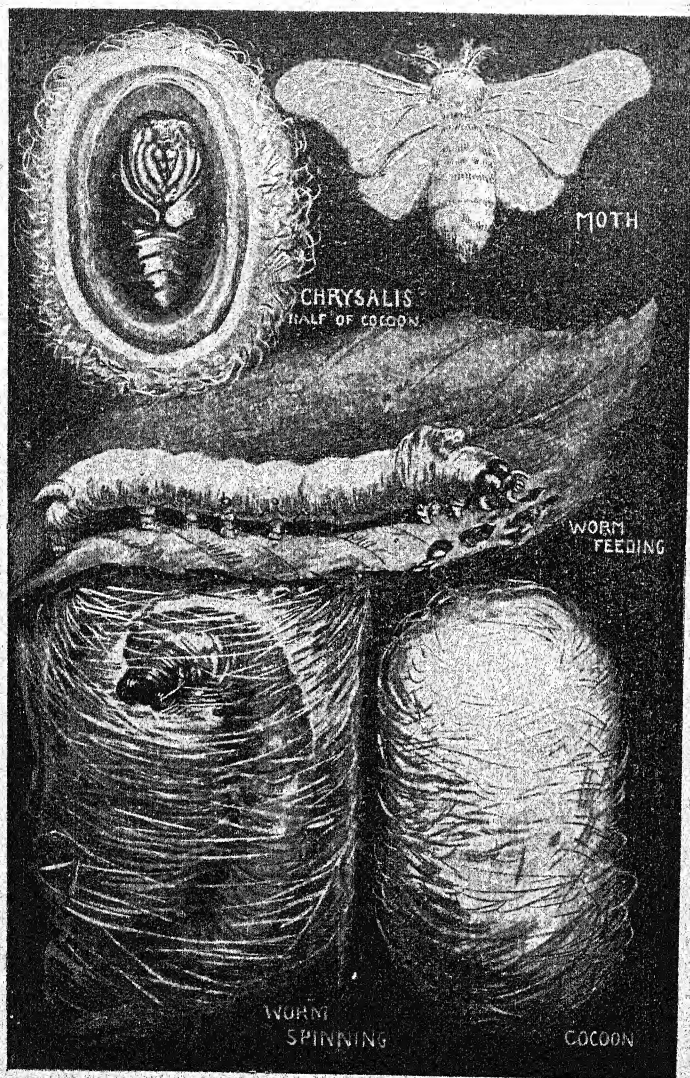
2. "Oh how cruel!" exclaimed the girls.

"It does seem so," said Mrs. Moore, "but if the insect stays in the cocoon until it comes out of its own accord it spoils the silk, for it sends out a dark-coloured liquid, which stains the cocoon, while it softens the fibre so that the insect easily pushes its way through. People used to think the worms ate their way out, but that was a mistake.

3. "Of course the silk grower lets some of his best cocoons be spoilt in order that some of his best spinners may come forth naturally, and provide him with a good crop of spinners for the next season."

By this time the thread was unwound from the cocoon as far as it would go without frequent breaks.

"Ah," said Mrs. Moore, "we have now



A SILKWOEM IN ALL STAGES

come to what is really waste. Here it is like a silky skin cover, and I will cut it open."

4. What did the girls see?

A brown shiny ringed body without head or tail, legs or wings. It could not of itself move from place to place, but if touched it wriggled as if saying, "I'm still alive."

Whatever is it? they all wanted to know.

5. "This is the pupa or chrysalis. When it comes out of this form," said Mrs. Moore, "it will have four wings, which it will hardly use at all to fly with; it will have two large black eyes and two feather-like horns. Its colour will be of a greyish creamy white, looking very soft, as if its body were covered with a fine, floury dust.

6. "Because your cousins are here, I have told you what you will see, although I meant you to wait until your silk moths showed themselves."

Daisy and Clara whispered a few words together, and then Clara said, "Mother, we should like to give Alice and Mary a few cocoons, and then they will see what we also shall see."

"Thank you very much," said both Alice and Mary. "If our moths lay eggs we shall keep some worms next year."

7. In due course the moths all came out of their pupa state.

Mrs. Moore told the children that they should be kept in the dark, because they belonged to the night moth family.

Presently the moths laid their eggs and died.

Soon after this Clara lost her friends Daisy and Mabel, for they went to live abroad; but Daisy took some silkworm's eggs with her.

LESSON XXIV.

SILK MANUFACTURE.

re-mem'-ber	ma-te'-ri-al	bleach'-ed	brill'-iant
re-collect'	op-er-a'-tions	dis-solves'	thread'-ing
straight	throw'-ster	squeez'-ed	skeins
weav'-ing	or'-gan-zine	rins'-ed	col'-ours

1. "Mother," said Clara one day, "you remember showing us that picture of silk reeling?"

"Yes, dear, I recollect."

"Well, mother, I have been thinking that these reels were nothing like those in my workbox. I should like you to tell me about it."

"I think I can soon make that all plain to you. The silk, reeled straight from the cocoons, is raw silk. Raw silk is not ready

for weaving into material for wear, nor ready to make into sewing silk until it has gone through a few operations.

2. "The first process is that of **throwing**.

"The throwster winds several of the reeled threads together to make **silk yarn**, which is then done up for sale in the form of hanks or skeins.

"The best cocoons are chosen to make the best yarn, called 'Organzine,' for the warp threads of silken goods, and the next best, called 'Tram,' will do for the weft threads.

3. "Thrown silk is still raw silk, but after it has been **stripped, boiled off, bleached** and **dyed**, it is ready for the weaving machines. Stripping is taking away the silk gum, and this is done by threading the hanks on wooden rods, and letting them hang free in large vats containing nearly boiling soapy water. The silk is moved about in the hot water for an hour. It is at first sticky and swells out, but after a time the silk gum dissolves and leaves the fibre clean and shiny. Then the hanks are squeezed and rinsed well in another soapy warm water.

4. "Boiling off is done by placing the stripped silk in bags, and plunging them into boiling vats or kettles of soapy water for half-an-hour.

"It is only like a second stripping bath, just to make the silk quite clean and ready for bleaching.

"Bleaching means making white, and this is done by more boiling and drying in the open air.

5. "After bleaching, silk will take the most brilliant colours in the workrooms of the dyer, and when bleached, or dyed, it is ready to be woven or twisted into sewing silks.

"Silken goods, though light in weight, feel warm to the wearer, because silk is a **bad conductor of heat.**"

LESSON XXV.

WHAT THE FAIRY HEARD AND WROTE DOWN.

re-ceiv'-ed	o-blige'	sigh	daugh'-ter
mys-te'-ri-ous	re-mov'-ing	to-geth'-er	list'-en-ed
fire-irons	be-lieve'	ad-mir'-ed	con-ver-sa'-tion
un-der-stand'	per-ceive'	rel'-a-tives	tight'-ly
in-tend'-ed	ex'-cel-lent	mem'-ory	knock'-ed

1. One day Clara Moore received a long letter from Fairy Wantutoknow.

"I'm sure this is Aunt Jenny's writing," Clara said to herself. "I'll see what she says."

The letter began:—

MY DEAR CLARA,—I can tell you all about the mysterious sounds heard by the fender

and fire-irons last night, because I am a fairy and can understand all sorts of talk.

2. The sofa - rug spoke first. She said, "Get off, you rude thing, you are crushing me. I was made to cover Mrs. Moore while she rests, but it never was intended that I should bear your weight."

"I am sorry I cannot oblige you by removing myself," said the overcoat. "Harry Moore flung me here, and here I must remain until some one puts me on my peg. I believe I was made to be a comfort to Harry, and keep him from getting cold. I would rather do that than hurt you, I'm sure."

3. "Pray forgive me for calling you rude," said the sofa-rug. "I perceive that you have excellent manners. You have taught me a lesson. Ah," she continued with a sigh, "my mother was a gentle creature, and I was gentle until I was parted from her, but since then I have gone through so much and am so changed that my own mother would not know me."

4. "Dear me," said the overcoat, "have you, too, known troubles and changes? Mine has been a hard lot. I have known no peace since the day I was shorn from the back of a sheep."

"Shorn from the back of a sheep?" exclaimed the sofa - rug. "Why, you must be



my own dear brother. The mother I spoke of was a sheep. Like yourself, I have had little or no peace since I lost her."

5. "Only to think that we have been in this room together for so long and did not know each other," said the table-cloth. "My dear rug, I have admired your colours and pretty pattern many a time, and now I find that we are relatives. I can carry my memory back to the days when my mother sheep frisked about the fields, and the farmer's daughter took her home to be her pet lamb.

6. "After that there came a day when I was shorn from the back of that lamb, and my trials began. Of course I was not a table-cloth then."

Whilst the table-cover was speaking, I heard sounds from a very large parcel which lay on the side-table. I listened, and heard a voice say, "Please, dear fairy, will you untie the string and let us out? We want to join in this conversation."

"Certainly," said I, as I set them free.

7. The goods which had been folded very tightly now sprang up to fill more space, and in so doing knocked something down.

"What was that?" exclaimed rug, overcoat, and table-cloth in one breath.

"Nothing to be afraid of; only a few more of your relations," a voice replied.

LESSON XXVI.

WHAT THE WOOLLEN GOODS SAID.

par'-cel	blank'-ets	lla'-ma	mix'-ture
burst'-ing	serge	flan'-nel	hon'-est
our'-selves	me-ri'-no	cush'-ion	re-spond'-ed
your'-selves	al-pa'-ca	shoul'-ders	gath'-er-ing
tramp'-led	val'-u-a-ble	brill'-iant	con-tin'-ue

1. "Perhaps you saw a large parcel before the lights went out," the speaker continued. "Well, we all felt bursting to tell you that every one of us can trace ourselves back to a sheep, and therefore belong to the same family as yourselves."

"How came you here?" asked the tablecloth.

2. "Mr. Draper's man brought us. Mrs. Moore and her daughter came shopping to-day. I heard her say that as winter was coming on she must buy blankets and warm stuff for clothing. I am a piece of home-spun tweed, and shall soon be Harry's new suit."

Another speaker said, "Mrs. Moore chose me for herself. She knew that I should wear well and look nice, for I am a beautiful blue serge. Clara is to have the red merino made up. The white alpaca and pink llama are bought for party frocks, but the stockings are for Harry."

3. "Let each one speak for himself," said a roll of flannel. "I am to be made into

shirts. I am aware that my colours are not brilliant, but they are *fast*. I shall wash and look nice as long as there is any life left in me."

"You need not say nasty things because our colours fade in soap and water," said the Berlin wools; "we are all very well in our own places. We know Clara is going to make a pretty cushion-cover with us, and she will knit wool boots for a new little baby with the white skein."

4. "Clara's grandma will be very glad when I am a warm shawl round her shoulders," said some Shetland yarn.

"Why don't you speak," said the tweed to some pants and vests.

"For the reason that we hardly dare say that we are of your family," answered one. "We know that we can trace ourselves back to the coat of a sheep, but we can also trace ourselves back to a tree, and we feel within us that we are a mixture. It was no fault of ours that we were sold as 'All wool.'"

5. "You are at least honest," said the sofa-rug. "I shall be proud to own you as cousin, if not as sister."

"Yes, indeed, you certainly are relations of ours," the rest responded.

"If this is a family gathering, I might as

well make my claim. I have let myself be trampled upon long enough," said the carpet. "It is true I do not clothe the human body. but I clothe cold, bare floors, and help to keep the house quiet and comfortable. I can trace myself back to a sheep's coat. I am of your family, and I say we have every reason to be proud of ourselves.

6. "Next to furs, we wools make the warmest kind of clothes. If we are not so rich as silk, we cost less and last longer. If silk has been in use ever since the world was young, why, so has wool. We read of the value of wool in the Bible, and it is just as valuable to-day.

"Brothers and sisters, let us continue in well-doing and keep up our good name."

LESSON XXVII.

WHERE WOOLS COME FROM.

suf'-fer-ed	Aus-tra'-li-a	mur'-mur-ed
wool'-len	is'-land	a-ston'-ish
art'-i-cle	shep'-herds	ev'-ery-where
re-plied'	Scot'-land	pleas'-ant
be-hav'-iour	A-mer'-i-ca	fright'-en-ed
his'-tory	in-ter-rup'-tions	re-sum'-ed

1. "My children," said the sheepskin hearth-rug, "I cannot lie here and listen

to you without being filled with joy to find you so proud to trace yourselves to me.

2. "Until to-night, I had no idea that I had so many of you near me. Truly you have all been changed till a sheep would not know you for her own., I heard some one say that you had gone through trials. For myself, I have suffered nothing beyond being treated with salt and alum to keep me from decay, and enable me to become a warm durable rug. Will you tell me what you have had to put up with?"

3. "Yes, yes," said every woollen article in the room.

"One at a time, then. Will you begin, dear sofa-rug?"

"You honour me," the sofa-rug replied. "I will tell you my history as far as I can remember it. I was born on an English farm——"

4. "*I* first saw the light on a wide sheep run in Australia," said the overcoat.

"The stockings and I were born in Bonny Scotland, where the rough North Sea washes the shores of my Island home. *I* was spun by hand in an old cottage," said the Shetland yarn.

"A Welsh mountain was *our* first home," said the flannel and the blankets.

"An American mountain was *our* birth-place," the alpaca and llama said together.

"*I* came from Spain," the merino remarked.

"*We* come from Germany," the Berlin wools chimed in.



SHEEP ON AN AUSTRALIAN RUN

5. "Well, really," the sofa-rug called out. "If I had not learnt a lesson in good manners first thing to-night, I should have been vexed at your interruptions, but you have as much right to say where you come from as I have."

"You all astonish me," said the hearth-rug; "why, there must be sheep here, there,

and everywhere, in fact all over the world. However, let us try not to interrupt our friend again. I think, dear, you were saying you were born on an English farm."



SHEEP ON AN ENGLISH FARM

6. "That is so, and life was pleasant, till one day I was frightened by the strange behaviour of the sheep dog.

"Our flock had always thought him a friend, and trusted him to lead us into new pastures, but on this day he made us run into a stream. Luckily the shepherds were there to catch us, but they kept us in the

water until we turned quite pale, and were wet through. However, the sun and air soon set us right again."

7. "We remember such a day, and such a fright, and such a washing," murmured the company.

"Soon after this," the sofa-rug resumed, "we were driven into a yard, when a man with a pair of shears cut away our only support. I was not in any pain, but oh, the feeling of being without my sheep was awful; I could not stand up against it, but fell down in a limp heap as I heard myself called a fleece."

LESSON XXVIII.

THE SOFA-RUG'S STORY.

mer'-chant	sta'-pled	fi'-bred	di-vid'-ed
squeez'-ed	straight	search'-ed	quiv'-er-ing
whis'-per-ed	list'-en-ers	shiv'-er-ed	nur'-ser-y
en'-gine	leath'-ern	mon'-ster	emp'-tied
comb'-ed	calm	hap'-pen-ed	

1. "When I came to myself I was in a strange place, and I learnt that a wool merchant had bought the fleeces, and sent them off to his stores. Here we were 'sorted.' The long fibred, or long stapled, wool was placed in one heap, and the short stapled wool in another; the curly wool was divided from the straight, and so on.

"What had been bad enough to bear before was ease and comfort to what next befel.

2. "Crushed, squeezed, packed in a bale, we were sent to a place where they plunged us into great vats of boiling water, strong with soap and soda.

"Fancy, if you can, being boiled with soap and soda that searched into every fibre and stole from it every atom of that oil which made us so useful to the sheep in winter. However, the sheep wanted it no longer, and the merchant did not want it at all.

3. "At last we were taken out of the boiler, and lay free from grease and dirt of every kind, in a quivering heap."

"Were your trials over then?" asked the hearth-rug.

"Over? oh no! Listen! When we were cool and dry, and white as curly locks could be, we were carried to a room, the very thought of which makes me shiver."

"We know," whispered the listeners, and they too shivered.

4. "Do you know what a drum is?" asked the sofa-rug.

"Yes," replied the hearth-rug. "I know. Harry left one with me a long time ago,

till his mother made him take it to the nursery."

"Well, dear sheepskin, I want you to think of a great room full of drums, each one many times bigger and stronger than a plaything drum. The drums I mean were made of thick leather, with fine steel points sticking out all over them.

5. "A monster steam-engine and strong leathern bands made the drums turn so fast that no one could tell what they were made of while they were at work.

"The basket I was in was emptied into a sort of tub in front of one of these turning drums. I was caught up by the cruel steel wires, and torn thread from thread.

6. "I certainly lost my senses then, but when I became calm again I was told that I had been **carded** or **combed**, and that my threads were lying even, and all the right way."

"Were you all carded?" asked the hearth-rug.

"Yes, indeed, we were," they replied.

7. "Alas, my poor children, what happened next?"

"Spinning followed," replied the sofa-rug, "but that was not done all at once, and was easy to bear."

LESSON XXIX.

THE SOFA-RUG'S STORY—*continued.*

at-tend'-ed	ma-chine'	frame'-work	ex-cept'
loose	spin'-ning	knit'-ters	fac'-tor-y
un-twist'-ed	doub'-ling	suf'-fer-ed	hos'-iery
hop'-pers	re-ceiv'-ed	nat'-ur-al	dye'-ing
con-fess'-ed	mix'-ture	trous'-ers	mi'-cro-scope

1. "Nice clean girls attended to the spinning. Broad sheets of carded wool were made to pass through a round hole. This changed the sheets into loose round untwisted lengths, like ropes without any strength in them.

"These ropes fell in coils into tin pipes called hoppers.

"Next, two hoppers were placed side by side near a machine, which slightly twisted both loose coils, and passed them out as **first doublings** or **sliver** into a second hopper.

2. "Doubling was done several times, and after each doubling the fibres were closer and closer together, and the rope became finer, yet stronger, till at last it was a thread and received the name of **yarn**."

"Was this the end of your troubles?" asked the sheepskin rug.

"Not quite, but my story is nearly ended. Like the Berlin and the Shetland wools, I

was chosen to be made into knitting yarn, so I went through a few more doublings and twistings, and was then reeled off into hanks or skeins."

3. "After that *we* were bleached," said the white wools. "And *we* were dyed," added the coloured ones.

"Yes," said the sofa - rug, "and I do think that the bleaching and the dyeing were the worst things we had to put up with, except that dreadful carding.

4. "Now, I ask, have any of you suffered more than we knitting yarns?"

"Yes," said a vest. "After being made into yarn, *I* was wound round a spindle or bobbin by a machine called a 'spinning jenny,' and then was sent to a frame-work knitter, so that I can tell you what went on there.

"I was neither bleached nor dyed, for my owner wanted **natural wool**. I was taken to a factory where many machines clitter-clattered as they made garments with the same shaped stitches as hand-knitted ones; but the machine work was very much finer, and the web was made very much faster than hands could do it.

5. "Vests, trousers or pants, bodices, socks, stockings and other articles for under-

wear, as well as gloves, are made with the knitting stitch, and all these knitted goods are called **Hosiery**.

"Many garments are made of pure wool, or pure silk, but some are made of a mixture of materials. You know, I myself confess to being a mixture.

6. "It would not matter about being a mixture if only people who buy knew all about it.

"My advice to every one who wants a pure article is to test the fibres of which it is made. Take out a thread each way of the stuff, burn the thread, and if it shrivels up like a bit of burnt skin, you may say, 'This is all right, it came from a silk cocoon or from a sheep's coat'; but if it burns brightly, like a little candle flame, then you may say, 'This is certainly not pure silk or wool.'

7. "There is even a better test than that. Only put the fibres under a microscope, and all secrets will be told.

"Do you suppose a yarn buyer buys without his microscope? Why, I was tested myself, and my cotton fibres couldn't look like the wool ones, although they had been on the carding drum together."

LESSON XXX.

STORY OF THE HOSIERY AND
WOVEN GOODS.

scour'-ed	la'-bel-led	screw'-ed	sim'-plest
board'-ed	e-vents'	creak'-ing	pass'-age
i'-ron-ed	be-com'-ing	light'-ning	hed'-dle
par'-cel-led	a'-gon-ies	length'-wise	sel'-vedge

1. "How you do run on," said the hearth-rug; "but you certainly let us know a thing or two, so finish what you have to say."

"I haven't much more to tell, except that I went through many hands before 'I came here. I was knitted and scoured and boarded and brushed. (By-the-bye, the brushing was done to hide my cotton.) Then I was made up and mended in a weak place or two, and ironed, and folded, and stamped, and parcelled, and labelled, and sold to the shop-keeper, and at last here I am."

2. "The events of *my* life were somewhat different from those of my friend the hose," said the flannel. "After becoming yarn, I was both bleached and dyed, but those who have never been woven can scarcely credit the agonies of the rack.

"Fancy your threads stretched from roller to roller, and screwed so tightly that you couldn't help creaking."

"We know it very well," said all the woven goods.

3. "Once on the rack," continued the flannel, "there is no getting off until the very end is reached. But after a time I got used to it, and rather liked seeing a pattern coming into my body. I enjoyed seeing the weaver's busy fingers and sharp eyes always on the alert. How did I get a pattern? Oh, the weft threads helped to give me that. The rack which carries the warp threads is only part of a great machine called a loom. Weaving, you know, is as old as the hills, as the saying is.

4. "Hand weaving, and hand-loom weaving, have now gone out of use, but weaving is weaving all the same. It is only the *way* of doing it that has changed.

"Now, I was woven on a power-loom—that is a machine driven by steam power. I expect looms will be driven by lightning ere long."

"What is weaving?" asked the hearth-rug.

5. "My dear sheepskin, just look how Clara Moore puts her darning needle under and over the threads she places lengthwise across the hole in her stocking. This is the simplest form of weaving.

"You will, perhaps, think the weft thread has hard work to do, and is very clever to

pick its way under and over, across the warp threads, then back again over and under; but, bless you, the weft thread has nothing to do but just fly along a passage that has been opened for it, and fly back again when one passage is shut and another opened.

6. "It is the heddle that is the clever one. It does the work with my threads on the rack. I think a great deal of the heddle, I can tell you, for it lifts up and puts down the warp threads just as they are wanted. Then the weft goes merrily to and fro, making a safe self-edge or selvedge on each side.

"When weaving is done, we have only to be made to look neat and smooth by pressing and boarding."

LESSON XXXI.

THE OVERCOAT'S STORY.

ex-claim'-ed	spi'-ky	thor'-ough-ly	sur'-face
re-la'-tions	ar-range'-ment	stretch'-ed	al-low'-ed
ham'-mer-ed	full'-er	teaz'-led	con-ceil'
swoll'-en	felt'-ing	this'-tle	nurs'-ing
pa'-tient	en-dur'-ance	si'-lence	reign'-ed

1. "I have gone through more than all this," said the overcoat.

"What! more than this?" exclaimed all.

"Yes, friends and relations; I have been sorted, washed, boiled, squeezed, carded, dyed,

spun and woven, and yet was not thought fit to take my place in the shop, or in the home.

2. "From the loom I was thrown into a tank of soapy water, and in it I was beaten with heavy hammers.

"I know that I was made of some of the best curly wool that ever grew, and yet I was beaten. Indeed, I have heard that it was because I was so good that I was chosen to be so treated.

"Pray do not think I am setting myself up to be better than you, but still I know it was because of my curly, spiky fibres that I was hammered in the tank till it was hard to see my weft and warp threads.

3. "I was all swollen, and my fibres were so thick and matted that they never showed their under - and - over and over - and - under arrangement any more.

"A man called a fuller did this felting work on my poor body, and then I was thoroughly stretched, dried and pressed, and after this I was teased."

4. "Teazled! who ever heard of such a thing as being teased?"

"Cloths, my friends; cloths all know what it is to be teased.

"Teazles are a kind of thistle, with very stiff, spiky heads. These are so fixed that when the cloth is brushed up with them the

spikes pull up some of the fibres and form what is called a **nap**. After getting the nap up, great knives are used for cutting it down evenly, and this is followed by hot pressing to put a gloss on the surface.

5. "Not till all this is done am I allowed to rest. I am then ready for the cloth merchant."

"How true it is," said the sofa-rug, "that we have only to know the history of others to take the conceit out of ourselves. I have been nur-

ring a kind of pride in the trials I have safely come through, yet I find I am a long way behind the woven goods and hosiery in patient endurance, and further still behind the cloths."

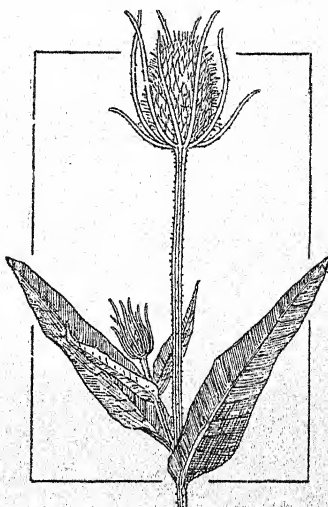
6. After this speech silence reigned in the room.

I only had time to write you this letter before dawn of day, and I leave it for you with my best wishes, because

I am

Your Good Friend,

WANTUTOKNOW.



A TEAZLE

LESSON XXXII.

CLOTHING FROM PLANTS.

jew'-els	hy'-a-cinths	au'-tumn	hand'-ker-chief
fox'-glove	cro'-cus-es	or'-chard	night'-gown
heath'-er	nur'-ser-ies	ve'-ge-ta-bles	pin'-a-fore
daf'-fo-dils	pleas'-ure	coll'-ar	bloss'-oms

1. Buttercups and daisies,
Oh, the pretty flowers,
Coming in the Spring time,
To tell of sunny hours.

Clara Moore was dusting the parlour and singing these words to a tune she knew.

"I love buttercups and daisies," she said as she finished her song and her work, and sat down near her mother.

"I, too," said Mrs. Moore, "am fond of them. They sprinkle the fields with gold and pearls. Flowers are the 'Jewels of Nature,' you know."

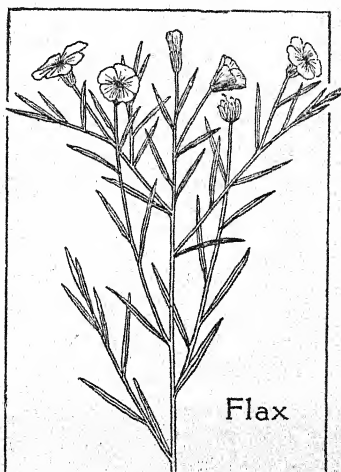
2. "Are there any other flowers which come up year by year as these do, mother?"

"Yes, child, there are many others. I've seen hill and moorland purple with foxglove and heather; and glades bright with yellow daffodils, or blue with wild hyacinths. I have also seen meadows decked with blue and white crocuses and golden cowslips."

3. "Are flowers of any use besides making the fields and gardens look nice, mother?"

"Yes, they are of great use. The petals which we admire are only a part of the whole flower, and when the bloom has died away the other part grows larger, till it is a perfect case in which the seeds of the plant can become

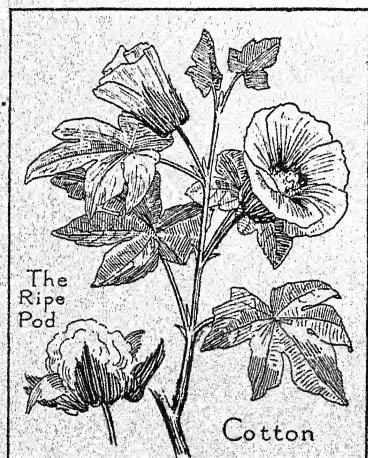
ripe, so we may say of flowers that they are



Flax

the nurseries of the plant world as well as the jewels of the earth.

4. "Some flowers are grown for our pleasure only, and many spring up wild, but many more are trained and helped by the gardener or farmer to grow into some-



Cotton

thing better than the wild plants they came

from, because they change into something we want, either to eat or to wear."

5. "How strange," said Clara; "do you know of any flowers which change into things to eat?"



HEMP

"Yes, Clara, I know a great many, and so do you. There would be no apples, pears, or nuts in the Autumn if the orchard trees were not beautiful with blossoms in the Spring. There would be no bread if wheat did not flower, and afterwards form the corn in the ear."

6. "I know now what you mean, mother,

and can think of many fruits and vegetables that come after their flowers have died away; but I cannot think of any flowers that change into things we wear."

"Very likely not," replied Mrs. Moore, "because you have not seen a pinafore tree nor a collar plant, nor any sheet, shirt, and night-gown shrubs. Why I don't think you have seen a pocket handkerchief or a bit of lace or even a straw hat growing."

7. "Mother, you are laughing at me. Of course those things don't grow.

We buy the stuff at the shops and make them at home."

"That is true, Clara, and yet there are trees, and shrubs, and plants that grow the stuff from which we make many of our garments. Nature herself changes some of her flowers into things ready to be eaten, but she does not change any of them into ready-made clothing."



JUTE

LESSON XXXIII.

HANDIWORK—FLAX.

strok'-ed	palms	man-u-fact'-ures	Ire'-land
won'-der-ing	thought'-ful	stalks	Holl'-and
coax'-ing-ly	fi'-brous	for-got'-ten	Bel'-gi-um
cre-a'-ted	hand'-i-work	treat'-ment	coun'-tries
height	im-ag'-ine	con-sid'-er	touch'-ing

1. "Clara, my dear," continued Mrs. Moore as she stroked her little girl's hair, "have you ever wondered why we think ourselves so much better than all other creatures?"

"I don't think I have ever thought about it before, mother, but you have set me wondering now. Tell me something about it," said Clara as she took her mother's hands coaxingly into her own.

2. "Clara, you are holding my hands in yours, and so there are four of the most wonderful of created things touching each other."

"Do you mean our hands, mother?"

"Yes, I do; just look at your hands, feel the soft palms, spread out your fingers, now close them, and notice the easily bending joints, and yet the firmness of the grasp.

"Now let your thumbs touch each of the four fingers of the same hand. Think of the work which hands can do, and then you will

know at least one reason why human beings



IRISH SPINNING-WHEEL

(From a Photograph by W. Lawrence, Dublin)

consider themselves better than other creatures.”

3. "It must be because of our hands," Clara whispered.

"Yes," Mrs. Moore replied. "The thoughtful brain and the useful hand of man enable him to do what no other animal can do.

"Man finds woolly or silky coats on sheep and goats; he takes the natural coat and *handiworks*, or manufactures, them into woollen cloths of many kinds. He also finds plants and shrubs which have fibrous seed-cases, or fibrous stalks. He takes these plant fibres and *handiworks* them, very much in the same way as wool fibres are treated. Stalks of the corn plant are plaited into bonnets and hats."

4. "I have not forgotten, mother, what Auntie's letter told me about the treatment wool got. And do these plant fibres have to put up with the same treatment?"

"Yes, Clara; they have to be sorted and cleaned and carded and doubled and spun into yarns.

"Sometimes the **yarns** are bleached or dyed, but often the bleaching, dyeing, and printing come after the weaving is done."

5. "Mother, you haven't told me the names of these vegetable threads, nor where they come from. Do they grow in England? Have you seen them growing? Do they look fibrous and curly?"

"What a number of questions, Clara. Let me see if I can answer them before you ask any more; but first find your book with the map of the world in it."

6. When the map was found Mrs. Moore said, "Look for Ireland, Holland, Belgium, and Russia. These are the chief countries from which we get our supply of the fibrous plant which has been the longest time known and used by mankind. Its name is flax, and it is not much grown in England. If we could visit one of these flax-growing countries about the middle of June we should see fields of flax in bloom. The plants are slender and grow about the height of our corn. They have pale green pointed leaves close to the stem, and on the top there is a bunch of sky-blue star-shaped flowers."

7. "Oh, how lovely," exclaimed Clara.

"Yes, lovely," said Mrs. Moore. "A poet describing the beautiful blue eyes of a child says, 'Blue were her eyes as the fairy flax.' So you may just imagine a field of blue eyes looking upward to the blue sky."

LESSON XXXIV.

MORE ABOUT FLAX AND LINEN.

pet'als	rett'ing	soak'ing	va'ri-ous
care'full-y	stripp'ing	brit'tle	qual'i-ties
se'-par-a-ted	down'-wards	man-u-fact'-ur-er	dam'-ask
ripp'ling	shall'-ow	lin'-seed	coarse

1. "The flax seeds were planted in the Spring for something more than flowers, so the plants are left growing. In July the petals and the leaves have fallen off, and the seed cases have grown into little dry round balls with ten ripe seeds in each.

2. "Now, men, women, and children go into the fields and carefully pull up each plant. Little bundles of them are laid in the sun to dry."

"Where are the fibres, mother?"

"In the stems, Clara."

"And can they be pulled out?"

"No, my child; they are not pulled out; they are separated from the useless of the stem by rippling, retting, drying, and beating."

3. "Whatever are rippling and retting, mother?"

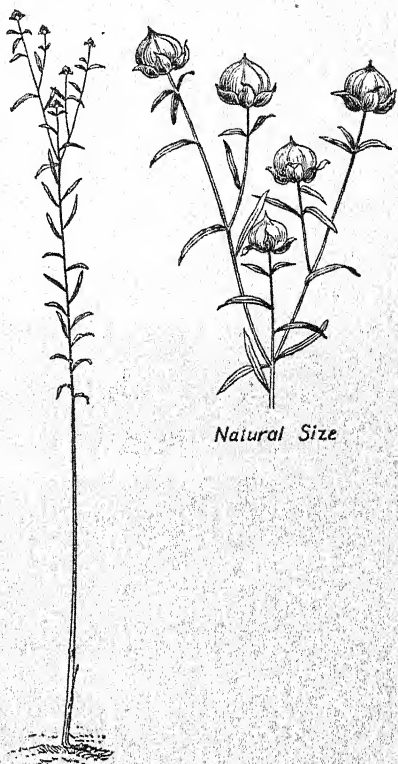
"Rippling is stripping the seed cases from the stems. Men draw each flax stem be-

tween the teeth of an iron comb. The seed pods drop on one side of the comb while the stems remain in the hands of the workmen. Retting is only another name for rotting."

4. "Must the flax be made rotten, mother?"

"Not the whole of the plant, Clara; the useful parts will not rot. The flax is placed with its root downwards in a shallow pool. Here it stays from eight to twelve days, till all the soft parts of the stem can easily be washed away. That which remains, after the hiving, is well dried.

5. "There is still a woody part to be removed, but the soaking and drying has made it so brittle that, when the stems are beaten on a wheel, the wood soon breaks and falls off in bits.

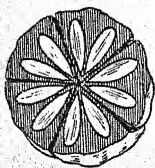


FLAX PLANT IN SEED

"When the linen fibres are free from bits of all sorts they are packed into bales and sent to the manufacturer, to be made into many kinds of linen cloth."

6. "Linen fibres, mother? Linen cloth? I thought you were telling me about flax?"

"So I was, my dear. Linen fibres and flax fibres are two names for one and the same thing. The seeds formed in each flax flower are called linseed."



SECTION OF FLAX-POD
SHOWING THE LINSEEDS

"I wonder how that happens?"

"Because the old English name for the plant was Lin; now it is flax, and the fibre is flax, while the seed and the cloths keep the old name of Lin as in linseed and linen."

7. "Let me see if I understand rightly, mother. **Linseed** is set; up comes a **Flax** plant. From the flax plant we get **flax** fibre and **linen**; while linseed comes from the flax flower."

"You are quite right, Clara," said her mother.

8. "Are there many sorts of flax plants, mother? You spoke of many sorts of linen cloth."

"There are various qualities of linen fibre,

Clara. There is the quality that will make the finest lawn or lace or damask table-linen, which only rich people can afford to buy, and there is a quality which will make coarse sacking. Between these two are many degrees of goodness and fineness.

LESSON XXXV.

LINEN AND CALICO COMPARED.

coll'ars	diff'er-ent	ad-vant'age	clothes
Holl'and	cal'i-co	un-bleach'ed	moist'ure
kit'chen	pillow-cases	re-mem'ber	be-cause'
com-par'ed	what-ev'er	con'duct	in-stead'

1. "My white apron, for example, is not so even, so smooth, nor so fine as the linen which makes collars, cuffs, and fronts, but it is of a better quality than the brown holland which my morning aprons are made of."

2. "Huckaback bedroom towels and glass cloths are of a finer linen than that which makes the kitchen towels."

3. "My pocket handkerchief is very fine indeed when compared with linen towels or sheets and pillow-cases."

"Your pocket handkerchief is finer than mine, mother, and it feels different too."

"No wonder they look and feel different, Clara, for your handkerchief is not made of linen at all."

4. "What is it made of then?"

"It is a kind of calico made of a plant fibre called cotton."

"I always thought calico and linen were the same sort of stuff."

"Perhaps that is not quite your fault, for we often speak of our calico garments as body linen, and our calico sheets and pillow-cases as bed linen."

5. "Whatever is the reason we give the things the wrong name?"

"Because the name was there first, my dear. Linen had been made use of long before cotton was discovered. Garments and bed clothes were then rightly called linen, but now cotton is used in place of linen, yet the name remains."

6. "Is it because cotton is better than flax that we wear calico instead of linen?"

"Neither 'yes' nor 'no' will be enough to say in answer to that question, Clara. One great advantage cotton has over linen is its price. A yard of good fine calico, thirty-six inches wide, can be bought for sixpence or eightpence. A yard of linen as fine and as wide would cost from two shillings to half-a-crown. I gave eighteenpence a yard for my white apron linen."

7. "Stout unbleached calicoes cost from

threepence to fivepence per yard, and very pretty printed calicoes can be bought from fivepence to ninepence.

"The other day I bought a pair of calico sheets, big enough for a large-sized bed. They cost 9s. 11d. per pair, and the last linen sheets I bought cost 21s. 6d. per pair.

8. "The handkerchief you are using to-day cost $2\frac{1}{2}$ d., while mine cost $10\frac{1}{2}$ d., so that if cost alone is considered calico is better than linen; but, on the other hand, linen is better than calico because it wears longer.

"Many people prefer to wear cotton body and bed clothing. They say calico is warmer than linen.

9. "Do you remember that heat always wants to be moving off, and that some things carry it away much more quickly than others?"

"Yes, mother; I remember the teapot cosy would hardly let the heat go away at all."

"Well, my dear, when people say that calico is warm they mean that calico will not conduct their bodily heat so quickly away as linen will, and thus they feel warmer in cotton than in linen clothes."

LESSON XXXVI.

LINEN AND CALICO—*continued.*

pat'tern	stiff'ness	flan-nel-ette'	con-fess'
weav'ing	bright'ness	min'ute	chat-ted'
gen'tle-men	smooth'ness	per-haps'	puzz-led'
par-tic'u-lar	crum'pled	con-duct'ors	piec'es

1. "Cotton has yet one more advantage over linen. Our bodies give out moisture or sweat, and linen is so quick to take it in that linen next the skin soon feels damp as well as cold.

"Calico takes the moisture more slowly, and is less likely to cause a chill."

2. "I think these are very good things to be said for cotton, mother."

"Yes, Clara, but if looks are to count at all, linen is better than cotton. Calico is never glossy, and that is why calico has never yet taken the place of table linen, with its very beautiful pattern weaving. Then calico will not keep stiff when starched and ironed."

3. "It would never do to make collars of calico, would it, mother?"

"No, child, for most gentlemen are very particular about the stiffness and brightness and smoothness of their collars, cuffs, and fronts."

"Quite right too," said Harry, who came in just in time to hear Clara's remark and his mother's reply. "What looks worse," said he, "than a crumpled front or a dull limp collar."

4. "If you ask me which I like to wear best, I should say calico day shirts with linen cuffs and front; but give me flannelette night-shirts—they are so soft that one gets warm in a minute."

"We are not talking about woollen things," said Clara.

5. "Well, Clara," said her brother, "did you not know that flannelette was cotton?"

"No, I did not; I thought flannel things were made of wool."

"So they are, but somebody found out how to weave cotton into cloth that looked woolly and felt soft, like flannel, so they named the stuff 'flannelette,' and I can tell you flannelette is a good deal warmer than white calico."

"And I can tell you that it is not," said Clara. "But perhaps you feel warmer in it."

6. "Oh you knowing little puss," said her brother, laughing. "I expect you have been talking about good and bad heat conductors again. Well, can you tell me, miss,

why flannelette is a worse conductor than calico, when *both* are made of cotton?"

Clara did not feel quite so clever as she did before; she had to confess that she did not know.

7. "Harry, I leave you to explain," said Mrs. Moore, "for I have chatted too long, and must now do something else."

"But are you not tired of talking, Clara?"

"Oh no, mother, beside I should not like to leave off just where I am puzzled. If Harry will kindly tell me what I want to know."

8. "Here are pieces of calico, flannelette, and linen; I know you will want them," said Mrs. Moore as she went away.

"Now, Clara, just look at the calico. Hold it up to the light level with your eyes," said Harry.

"Miss Lowe showed us how to do that, to find out which was the right and which was the wrong side of the calico. The most fluffy side is the wrong side, because of the cotton fibres that won't lie flat."

"Right you are," said Harry.

LESSON XXXVII.

LINEN AND CALICO—*continued.*

scan	ma-te'-ri-al	pris'-on-er	nig'-gers
wrong	sur'-face	wrapp'-ed	ne'-groes
thous'-and	mill'-ions	ex-pect'	plant-a'-tion
man'-age	fringe	tire'-some	flan-nel-ette'

1. "Scan the linen as you did the calico," said Harry.

"I cannot tell the right from the wrong side," said Clara.

"There are no fibres sticking up on either side."

"Right again, Clara, now try the flannelette."

"Oh, here are thousands upon thousands of fibres sticking up, on both sides too."

2. "Those loose ends, my dear sister, are the clever little things which make the flannelette seem warmer than the calico, and the calico seem warmer than the linen."

"How do they manage to do that, Harry?"

"You see, if a smooth plain material, like linen, touches your flesh, every bit of its surface picks up some of your bodily heat, which then quickly flies away, and you feel cold; but if a material like calico touches your flesh, its fibrous points keep the woven

threads from coming quite close, and so less bodily heat is picked up and carried away by calico than by linen.

3. "Now, flannelette has its millions of fibrous threads, making quite a fringe on the surface of the woven cotton, and this fringe acts like a cage in which air is kept prisoner. Air, I must tell you, is a bad conductor of heat, so any one clothed in flannelette is wrapped in a coat of warm air, as well as in a cotton garment."

4. "How strange that seems, Harry, for if any one were to be without clothes they would have plenty of air, but would be very cold indeed in this country."

"Yes, that is so, but when a layer of air is caught and kept in the fibrous cage of the clothing, it gets warmed by the bodily heat, and then the body itself begins to feel as if it had something warm upon it."

5. "It makes me laugh to think about catching air in such a cage," said Clara.

"I will tell you about another trap to catch air in; a very simple one, too," said Harry. "You have only to wear two or three lightly-woven garments, they will keep you warmer than a less number of thicker ones, for there will be a layer of air caught

and kept between each of the thin garments and you will soon begin to feel warm. Besides, the air takes up a great deal of the moisture of the body, and keeps the clothing dry."

6. "I expect mother thinks of all these things for me now, Harry, but I'll remember them when I'm old enough to look after myself.

"Oh dear, I hope mother will not think me very tiresome, but I must ask her something."

7. "What do you want to know?" said Harry.

"Mother told me about linen fibre growing in the stem of the flax plant, and I want to ask her a lot about cotton, how and where it grows, and how we get it."

"Don't bother mother now, Sis, just wait a bit," said Harry, as he went off singing—

"Ten little niggers, picking cotton in the
sun,

All heard the dinner-bell and then began
to run."

LESSON XXXVIII.

COTTON GROWING.

In'-di-a	holl'-y-hock	empt'-ied	vel-vet-eens'
E'-gypt	wal'-nut	car'-go	cor-dur-oys'
quan'-ti-ties	de'-li-cate	en-gag'-ed	fust'-ian
em-ploy'-ed	down'-y	mus'-lins	sur-pris'-ed
ma-chi'-ne-ry	deaf'-en-ed	south'-ern	coun'-tries

1. "I have found a few pictures for you. Look at this one first, Sis; it is a picture



A COTTON FIELD IN THE RICH LOWLAND OF THE MISSISSIPPI RIVER.

(By permission of Detroit Photographic Co.)

of a cotton-field or plantation, with negroes at their work amongst the rows of ripe cotton.

"To see the real plantations," Harry went on to say, "you would have to go to coun-

tries much hotter than ours. India, Egypt, Brazil, now grow cotton in large quantities, but the real home of cotton is the Southern States of North America, where people say 'Cotton is king,' because so much of the land is used for cotton growing, and so many of the people are employed in one way or another in the cotton business.

2. "There are cotton trees which grow fifteen or twenty feet high, but the plant which grows the fibre we want is a shrub from two to three feet high."

"Has it a flower?" asked Clara.

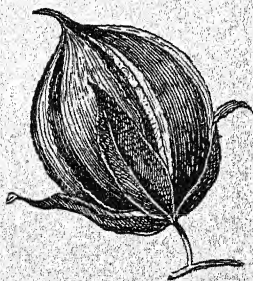
"Yes, here is a picture of it."

"What a beauty; it is like a yellow bell; its short stalk for a handle."

"It is very much like our English hollyhock," said Harry.

"Does this pretty flower change into cotton, or is the fibre in the stem?"

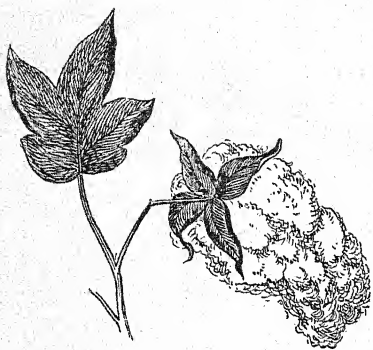
3. "When the flower has died away it leaves a pod, which grows about as large as a small walnut. Inside the pod are some baby cotton seeds, most carefully wrapped in a downy covering."



POD OF COTTON

"They must be delicate," said Clara.

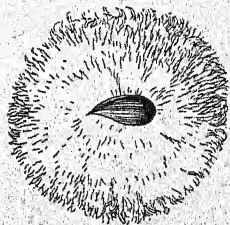
4. "When the pods are quite ripe they burst, the white woolly seed-covering fluffs out, and the rows of cotton shrubs look as if they were covered with snow. Then cotton harvest begins.



COTTON POD BURST

are negroes. Men, women, and children pass up and down the rows of cotton shrubs, picking the ripe tufts from the pods, and filling basket after basket with downy fibres and brown seeds.

5. "The baskets are emptied, and the cotton spread out to dry in the sun. Afterwards the seeds are separated by a ginning machine, and the raw cotton, as it is called, is packed tightly into bales and sent to the factories.



COTTON SEED

"Ah, yes," said Clara, "when it gets to the manufacturer its troubles begin. I'm glad these things cannot feel, and

we only pretend that they are troubled when sorted and cleaned, and combed, and spun, and woven, and bleached, and printed, and everything else."

6. "A very great deal of the raw cotton comes to England, Clara. Liverpool and Manchester are the chief ports the cotton cargoes come to, and Manchester, Oldham, Blackburn, Bolton, Wigan, Rochdale, Chorley, and other Lancashire and Cheshire towns, are the towns in which cotton is manufactured.

"Thousands of people are engaged in the mills making yarn, or sewing cotton, or weaving goods of many sorts, such as calicoes, flannelettes, muslins, prints, velveteens, corduroys, fustian, and other clothing material.

7. "Here, too, they make yarn for lace curtains and lace trimmings. I will try to take you some day to Manchester. You will be very much surprised at the machinery, and nearly deafened with the noise of it, and if you are not tired now, I think you will be then."

LESSON XXXIX.

NEGRO LABOURERS.

Af'-ri-ca	gov'-ern-ment	fer'-ried	em'-pire
slav'-er-y	suc'-ceed'-ed	po'-em	jeal'-ous
for'-eign	e-man'-cip-ate	shack'-les	be-speak'
shipp'-ed	sin'-ews	cir'-cul-ate	A-mer'-i-ca

1. "Harry, just tell me one thing more."

"Well?"

"I thought Negroes were the people of Africa, and you have been saying that the Negroes do the work on the plantations in America."

2. "Ah, that is rather a sad tale to tell. Years ago, people used to steal men and women from Africa; they used to drive the poor Negroes to the ships, which carried them in slavery to foreign countries. Many thousands of slaves were shipped to America and made to work on the land.

"At last, better feelings came into the hearts of some English and American men and women, and they never left off trying to make the Governments, both in England and America, pass laws against slavery.

3. "After a good deal of hard work they succeeded, and now there are no slaves. The coloured people who work on plantations are free men and women."

"Oh, I am glad," said Clara.

4. "You must read 'Uncle Tom's Cabin.' That was one of the books which helped the feeling against slavery to spread amongst white people. Here, too, is a part of a poem which also helped to bring people to their right minds about their fellow-creatures.

5. ON SLAVERY (*Cowper*).

I would not have a slave to till my ground,
 To carry me, to fan me while I sleep,
 And tremble when I wake, for all the wealth
 That sinews bought and sold have ever earned.
 No; I had rather be myself the slave,
 And wear the bonds, than fasten them on him.
 We have no slaves at home—then why abroad?
 And they, themselves, once ferried o'er the
 wave
 That parts us, are emancipate and loosed.
 Slaves cannot breathe in England; if their
 lungs
 Receive our air, that moment they are free;
 They touch our country and their shackles fall.
 That's noble, and bespeaks a nation proud
 And jealous of the blessing. Spread it then,
 And let it circulate through every vein
 Of all your Empire; that, where Britain's
 power
 Is felt, mankind may feel her mercy too."

LESSON XL.

DAY-DREAMS AND DREAMERS.

dur'ing	oth'er-wise	re-gain'-ed	wast'-ed
ev'-er-y-thing	di-vi'-sion	im'-a-ges	crea'-tures
bus'-y	as-ton'-ish-ment	a-rous'-ed	smash'-ed

1. What are day-dreams?

I expect you will say they are dreams which come in the daytime. That might be so, but if you were to fall asleep during the day, and a dream were to come to you while you slept, that would not be what is called a day-dream.

2. Day-dreams come to persons who are awake. They begin to think about something, and the thoughts come so fast one after another that everything else is forgotten for a time.

Day-dreams do not often overtake people who are busy at work, and think about what they have in hand, though they sometimes come upon people who ought to be busy.

When this happens day-dreams help to waste time, and spoil what would otherwise be good work.

3. I once knew a little girl who ought to have been very busy, learning how to do long division sums, but somehow she fell thinking deeply about a new frock.



"KICKING OUT HIS FOOT, HE SMASHED HIS IMAGES"

"How many times can I get nineteen out of twenty-five?" the teacher asked, and our little dreamer answered 'French merino.'"

Her classmates looked up in astonishment. Her teacher was pained and vexed. She herself was ashamed, and you may be sure she left school late that day. She had to try to make up for lost time, but lost time can never be regained.

4. I dare say you know the tale of the Turkish man, who sat down to rest beside his tray of images. He had a waking dream about the money he meant to make by selling his wares at a profit; then buying more and selling again until he was so rich that he had servants whom he cuffed and kicked when they did not instantly obey him. In kicking out his foot to punish one of his dream-servants, he smashed his images, and aroused himself only to find that he was poorer than before.

5. But day-dreams are not always wasted thoughts and wasted times. When men or women dream about the good they can do for their fellow-creatures, and then set about carrying out their plans, the world is all the better for such dreams and such dreamers.

I hope you will read in other books a great deal more than I can tell you here

about the many good things we enjoy which sprang out of the day-dreams of those who were workers as well as dreamers. Yet I will tell you now about a few of those, whose dreams and work have done a good deal to make our clothing so nice to wear and so cheap to buy.

LESSON XLI.

DREAMERS AND WORKERS

(LEE AND HARGREAVES).

cler'-gy-man	cen'-tur-ies	dis'-trict
of-fend'-ed	Not'-ting-ham	old-fashioned
mar'-ry-ing	Lei'-ces-ter	jeal'-ous
suc-ceed'-ed	gi'-ant	part'-ner
hap'-pi-er	im-prove'-ments	se'-cret

1. More than three hundred and fifty years ago, a young clergyman named William Lee offended his friends and relations by marrying the lady he loved. He became very poor, so poor that his wife had to knit, knit, knit all day long, making stockings to sell for food and shelter for herself and family.

Truly, the poor woman's work was never done.

2. The clergyman thought a good deal about his wife's never-ending work, and wished he could help her.

At last in one of his day-dreams he hit upon a plan for making a machine that would knit with its metal fingers faster than his wife could knit with her hands.

3. William worked hard, and at last succeeded in making his machine or frame. Then he himself became the first framework knitter. He made and sold stockings so fast that his family were better off than they were before, and, though never very rich, their lives were brighter and happier.

Centuries have passed, and now thousands of knitting-frames are at work in Nottingham and Leicester, and the small towns and villages near.

4. Even as the giant oak-tree is different from the acorn which at first held its life, so the hosiery machines in the great factories to-day are giants compared with William Lee's first knitting-frame.

Yet Lee's machine held the beginnings of all the others, which have grown by improvements from time to time.

Knitting machines could not have come to their present size and number and usefulness had it not been for other dreamers, who worked out their dream plans.

5. About a hundred and forty years ago, James Hargreaves lived in Blackburn, in the midst of the cotton district.

He knew that weaving looms were often idle for want of yarn, and he began to dream by day of a plan for making a spinning machine, which would do more and better work than the hand-wheels then in use.

At last he made a machine that would spin eight threads at one time.

He called it a spinning jenny.

6. Old-fashioned workmen were jealous ; they broke into Hargreaves' house, and smashed all his jenny machines and his model.

Hargreaves then left Blackburn and settled in Nottingham. Here he and a partner built a factory, and here he made new jenny machines, so improved that they would spin eighty-four threads at a time ; and yet it was so simple in its action that a girl could attend to it.

7. The spinning jenny might have brought Hargreaves a large fortune, but some one stole his secret, and then other cotton spinners made their own spinning jennies. However, by working his own machines he made a good living, and was by no means poor.

LESSON XLII.

DREAMERS AND WORKERS

(ARKWRIGHT AND CROMPTON).

bar'-ber	bor'-row-ed	shrewd	sat'-is-fied
tick'-et	schem'-ing	bar'-gain	re-al'-i-ty
shave'-d	starv'-a'-tion	prof'-its	con-tin'-ue
cus'-tom-ers	quar'-rel	sterl'-ing	light'-ning

1. About the same time that Hargreaves lived in Blackburn, Richard Arkwright, a poor barber, lived in Preston.

In his humble shop window Richard put a ticket, telling passers-by that he shaved for a penny.

2. The penny shave brought him many customers; but as soon as he had gained a little money he gave up the shop and spent his time trying to make a better spinning machine than the hand-wheel, for, like Hargreaves, he had seen that more and better yarn was wanted than the hand-wheel could supply.

3. Soon all Richard's savings were spent. He borrowed money, and that, too, soon went. His wife got vexed and broke his models, for, said she, "His dreaming and scheming will end in our starvation."

After this quarrel, Arkwright left his wife.

He made a new model of his machine and tried to borrow more money; but the banker would not lend him any, but advised him to take his machine to Mr. Strutt, who had a stocking-making factory at Derby.

4. Mr. Strutt was a shrewd, clever man, and soon saw that Arkwright's plans for doubling and twisting the carded wool between rollers was better than the jenny machine, and would make better stocking yarn than either the jenny or hand-loom.

Mr. Strutt and his partner made a bargain with Arkwright to share profits, and then they found him money to build a factory and set up his works.

5. The first cotton-mill was built by Arkwright in Nottingham, and his machines were worked by horse power.

Horse power cost too much money, so the mill was removed to Cromford in Derbyshire, where the water of the river Derwent turned the great water-wheel which kept the cotton-mill at work.

Arkwright's cotton-spinning machinery made a great fortune. When Arkwright died, he left nearly a million pounds sterling. His son kept up the business at a great profit, leaving seven million pounds.

Hargreaves and Arkwright each worked to

improve the making of yarn, though their methods were not the same.

6. Samuel Crompton, of Bolton, invented a spinning machine partly like Hargreaves' spinning jenny, and partly like Arkwright's roller. Because it was like both, Crompton named his spinner "The Mule," and the Mule spinning machine is the one now in use.

LESSON XLIII.

DREAMERS AND WORKERS

(STEPHENSON).

sat'-is-fied	fa'-vour-ite	pea'-cock's	feath'-ers
wa'-ter-wheels	mor'-als	splen'-did	reg'-u-lar
e-lec-tri'-ci-ty	jack'-daw	dain'-ty	fright

1. The next name I want you to remember is that of George Stephenson. He had waking dreams of what could be done with steam, and he was not satisfied until he had proved that it could do more work than men or horses, than water-wheels or wind-mills.

I have not time nor space to tell of all that steam can do, but this I must tell you, that steam has been used to drive nearly all the machinery in the world.

2. Spinning, weaving, knitting, sewing and lace-making machines have all been driven by

steam power; but there will come a time when steam power will be old-fashioned.

Many manufacturers have already left off using steam, and employ electricity to move their machinery.

3. I have just one other day-dream to tell you about, but this is quite a little one, and if it did not in the end prove a blessing to the world, at least our friend Clara Moore was all the better for it.

One dull, damp day, Clara had a cold, and could not go out. A nice fire was made in the sitting-room, and she sat alone on a low chair before it, with a few of her favourite books around her.

She looked longingly at a picture of Cinderella in her ball dress.

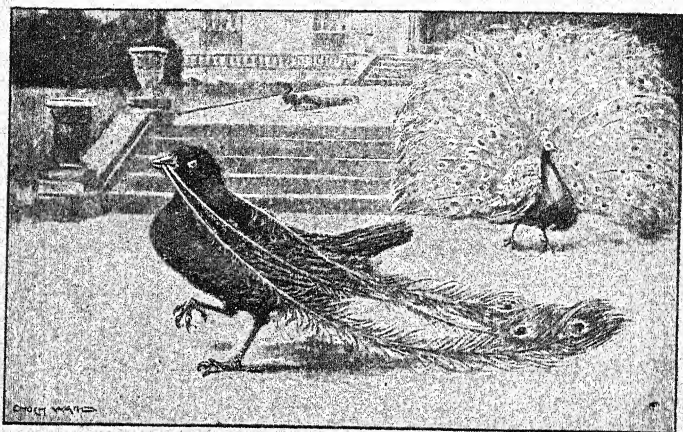
4. "If I were as rich as rich could be," she thought, "I would wear dresses of silver and gold and fine lace; but I should like white satin shoes instead of glass ones.

"Now I'll read a few fables," she said to herself, "but I shall skip the morals, they are so dry."

5. The morals would not be skipped, as you will see by her remarks when she looked at the picture of the jackdaw in peacock's feathers.

"Oh, you silly, silly bird," Clara said.

"You would have been a lovely jackdaw, your shape is so fine, your feathers such a splendid black, and your blue-grey head is beautiful, but you look a regular fright through trying to be fine in feathers that do not suit you.



THE JACKDAW IN PEACOCK'S FEATHERS

"Ah me," she said, "perhaps I should be just as silly if I dressed in silver and gold." Here the fable book closed of its own accord. Clara sat very still, and her thoughts came to her something like this—

6. "Well, I ought to know something about the proper way to dress by this time, or else I have thrown away all that mother and father, Harry, auntie and Miss Lowe, the silkworms and the flowers have taught me."

LESSON XLIV.

CLARA MOORE'S DAY-DREAM

—continued.

ti'-di-ly
 dain'-ty
 wa'-ter-proof
 in-di-a-rub'-ber

go-losh'-es
 a-wa'-ken-ed
 com'-fort-a-ble
 pinch'-ed

man'-sion
 re-col-lect'-ed
 ex-tra'-va-gant
 shoe'-less

1. "I know I ought to dress tidily and neatly, to take care of my clothes and make them last as long as they can, and I ought to mend even little holes, lest they should grow into big ones; and I ought to know something about the stuffs clothes are made of.

"Let me see; if I had to look after my own clothing, I would take care that I did not buy a stiff cage that would cramp my body so that it would not grow properly, and I would buy boots that fit my feet, and not try to make my feet go into boots of the wrong shape, or that have high heels.

2. "If I had money enough not to think about the cost at all, I should be sure to wear fine wool or silk clothing next my skin, and above these, fine linen garments, with real linen thread lace to make one look dainty. My dress should be made of wool or velvet or silk, and I would wear furs in

winter, and a waterproof cloak or coat, and indiarubber shoes or goloshes on wet days.

“Ah, but if I could not afford all this, I would still try to have woollen garments next my skin, even if I had to be contented with calico over garments; but, dear me, I am forgetting that flannelette is a good thing if I could not afford flannel.”

3. At this point Clara started up as if she had just awakened, and yet she had not really been asleep. She upset one of her books, which opened at a picture of Kitty Brown.

Poor Kitty Brown! far, far from dress of gold or silver, far, very far from the comfort Clara herself enjoyed. Shoeless, with only a ragged frock to cover her poor, wan, pinched body, Kitty stood begging at the door of a mansion.

4. Clara felt the tears of pity come into her eyes, as she recollected Kitty's story, and I am sure the picture made her feel that she would never be extravagant in dress, but would spend some of her pocket-money to buy material to make into useful garments for those who were without.

5. “If I were as rich as rich could be,” she said to herself a second time, “I would clothe, oh, such a number of children in clean, comfortable things.” Then she fell

into a day-dream about a good time coming,



"KITTY STOOD BEGGING AT THE DOOR"

when there would be no one in the world
half so poor as poor Kitty.

LESSON XLV.

THE TWO TAPS. PART I.

kitch'en	trick'ling	ei'ther	for-get'ting
seld'om	neigh'bour	buck'et	un-der-stand'
gos'sip-ing	run'ning	cis'tern	chim'ney
dwell-ings	con-tin'ued	ig'nor-ance	un'-der-ground

1. Two brass taps, which I will name No. 1 and No. 2, had hung their noses over a trough, or sink, in Mrs. Moore's kitchen for many months, but had not become very well known to each other.

One reason for this was that they seldom had their doors open at the same time, and therefore gossiping did not begin as soon as it does with some folks whose dwellings are close together.

2. However, one evening, No. 1 found that its door would not close so tightly as usual, and try as it would, it could not keep the water from trickling in a thin stream on to the sink.

"Dear me," said No. 2 to herself, "whatever is the matter with my neighbour. No one has been in the kitchen lately, and yet water is running out of the door. I'll be bound my path is wet, and not very clean either, for I have often seen quite dingy

water flowing out of her stores when the door has been wide open.

"At such times I almost wished I could turn my nose up."

3. The trickling continued till No. 2 could no longer check its inquisitiveness, and forced its own door a wee way open to see if she could find out something.

"What is the matter, neighbour?" said she. "Why do you let the water flow out when there is no bucket or bowl to catch your stream?"

"Alas," said No. 1. "I'm afraid my door is much worn and is no longer strong enough to keep the water back from the cistern."

4. "From the what?" exclaimed No. 2, opening her door a little wider.

"From the cistern, I said," replied No. 1.

"And pray what is a cistern?" asked No. 2. "I have never heard of one before."

"If you have never heard of a cistern wherever does your water come from?" said No. 1. "A cistern, of course, is the tank which catches the rain-water from the roofs of houses. I thought all taps were made to keep the water safe in the tanks, and only let it out when it was wanted?"

5. "What ignorance," said No. 2, forgetting its own ignorance. "I can easily understand

now why your stream is so dark coloured. It may well be black after it has washed the roofs of houses, not to speak of the chimney-pots with their soot and smoke. Now *my* water comes through a pipe underground, and it is always fit to drink."

LESSON XLVI.

THE TWO TAPS. PART II.

no'-tic-ed	re-quires'	al-low'-ed	sur-pris'-ed
sup-ply'	fast'-en-ed	quar'-rel-ling	strain'-ed
sauce'-pans	sieve	re-la'-tions	maiding-tub
rain'-fall	in-ter-rupt'-ed	ming'-ling	

1. "I am sorry to say that my water is not always bright and clear, as I have often noticed that yours is. Still we must admit that my cistern is often called upon for a supply, and although Mrs. Moore always fills the kettles and saucepans and water-bottles from your tap, yet she fills the copper and the dolly or maiding-tub and all the big and little washing trays from my tap.

2. "I have heard Mrs. Moore say that she would rather put off washing the clothes until after the next rainfall than she would use your water. She says it's so hard, and costs so much in soap and takes so much of her time, while mine is soft and only requires half the soap and not half the labour.

"Though my water is very dark sometimes, because it is used before the dirt has had time to settle, even then Mrs. Moore makes it very nearly clean and clear by pouring it through thick flannel fastened over a sieve."

3. "That's all very well," interrupted No. 2, "but give me the water that is fit to use at once, and does not have to be strained through flannel or allowed to stand for hours, aye for days, before it can be used."

4. "Sh— sh— sh— sh— sh—" said a stream of water forcing its way through the door of No. 2. "Are you two quarrelling about us? I am sure you would not do so if you knew what close relations we are. No. 1 has charge of sister Softly, and I am her brother Hardy."

"I wish you two taps could leave your places in the wall for a while and go about the world a little as we have done. Don't you wish they could, sister?"

5. "Yes, I do. I think they are both very good taps. Each stands up for the water it has to take care of. Let us tell them our story, brother. Our two streams are now mingling as they find their way to the drain. The taps, I am sure, will be surprised to learn that we have mingled before in other times and places."

6. "Aye," said Hardy, "that was when we were in the ocean, which these taps have never seen."

"But if we have not *seen* we have *heard* of five great oceans," said No. 1. "Clara Moore came into the kitchen one day and asked her mother to hear her say their names."

LESSON XLVII.

SOFTLY AND HARDY TELL THEIR STORY.

taste'-less	green'-ish	va'-pour	hap'-pen-ed
strange	weed'y	mur'-mur-ed	mount'-ain
hudd'-led	whis'-per-ed	sigh'-ed	chill'-ed
ex-act'-ly	re-minds'	cor-rect'-ly	part'-i-cles

1. "Tell me, Hardy," said No. 2, "in those times of which you speak were you bright, clear, and tasteless as you are now, and was Softly dark and smoky?"

"Oh no, that is one of the strange things we have to tell," replied Hardy. "We were neither of us what we are now. We were both exactly alike. We had a greenish colour, and a salty, weedy, fishy taste."

2. "No one wanted to drink us or cook food with us, and no one wanted to wash clothes or clean dirty paint with us. We

were in fact part of the ocean; but one day, long, long ago, something came over us."

"Not so *very* long," whispered Softly.

3. "Ah, that reminds me, sister, I must tell the taps that though both of us were once part of the same ocean, I must have left it before sister Softly did. What was it that came over us? I almost forget, it is so long since *I* left the ocean."

"It was the sun that warmed you, brother, and the air that carried you away."

4. "Thank you, sister, I well remember now. One day I was playing with many more particles of water like myself. We were tossing about in big and little waves, when all at once we felt as light as though we had wings. We wanted to go up and up, so we kept ourselves right on the face of the water. Then the soft warm air took us into itself and quite hid us from sight.

5. "'You are **vapour** now,' the warm air murmured to us as we left the sea and all its living things and its salts behind us. We were indeed pure then."

"Would that we had remained so," sighed Softly.

"I think, dear," said Hardy, "that though we are neither of us so *pure* as we were then, it is better for us to have become what

we are, and thus able to do the work we are made to do."

6. "You are quite right," replied Softly. "You have seen and known more than I have, and though you rose from the ocean long ago, and I but lately, you have told quite correctly how we came out of the waters into the air. Will you tell what happened next?"

"Yes, please go on," said the taps.

7. "Well, I, and those who rose up with me, stayed in the air as vapour, going higher and higher, and being moved about by the winds till at last we were blown over some cold mountain tops, and we felt so chilled that we huddled into a great mass high up above the earth. People below called us clouds."

LESSON XLVIII.

HARDY AND SOFTLY CONTINUE THEIR STORY.

peo'ple	for'tun-ate	chill'-ed	hur'-ry-ing
rat'-tle	splash'-es	house'-hold	o-blig'-ed
weath'-er	ad-ven'-tures	wa'-ter-ing	fun'-ni-est
act'-u-ally	wit'-ness	wet'-ter	go-losh'-es

1. "In the clouds we got colder and colder, and the closer we clung together the wetter

we became, until at last it was no use trying to make believe we were things of air.

"We all knew that we belonged to the world of water, and must hasten back to our home.

2. "When once we had made up our minds to come down we came with a rush in millions of drops, and people gave us a new name, saying, 'Here comes the **rain**,' or if a cold blast of air caught us while falling, we should rattle on the earth in **hailstones**. In very cold weather we actually froze into flakes before setting forth from the clouds, and then we looked like white downy feathers in the air, but we were feathers of **snow**. We made quite a stir in the world, I can tell you.

3. "We did not all get back home as quickly as we hoped to do. Many drops were fortunate enough to plop right into the ocean, where, for anything I know, they have been happy ever since.

"Some millions of drops broke their pretty round bodies into flat splashes on the ground. I was amongst those, and I have had some strange adventures since.

4. "Up to the moment I touched the earth, I was as soft as my sister."

"I can bear witness to the truth of

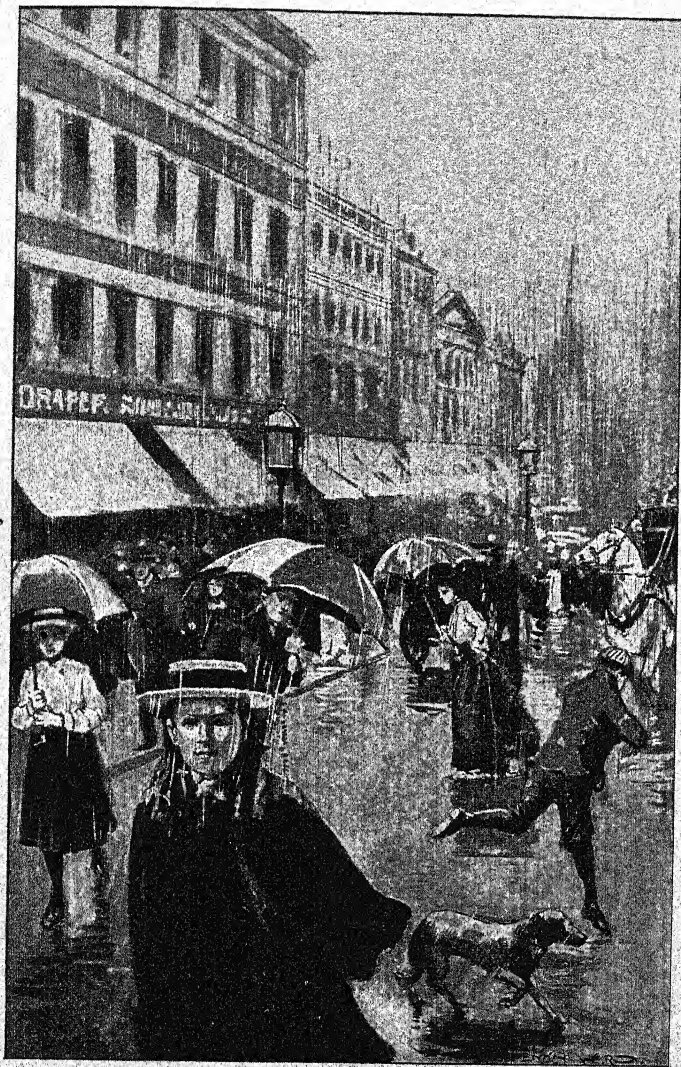
everything that Hardy has told you," said Softly, "for my life has been the same as his up to this point.

"I rose silently and unseen from the sea. I was chilled by cold winds from the north, then the cloud I helped to form came pell-mell to earth right over this town and the country round.

5. "I know the people were glad of our rain, because I heard them say so. To go no further than this very household, Mrs. Moore said we should save her the trouble of watering the garden, and she wanted us badly for washing the clothes,

6. "But it was fun to see folks hurrying to take shelter until our worst rush was over, or if they were obliged to be out, they wore cloaks lined with india-rubber, and put goloshes over their boots; but the funniest thing of all was the stick with half a balloon at the top, which nearly everybody carried to keep the wet from their clothing.

After sliding down the roof, I only remember being caught in the tank from which I am drawn when wanted. Now that the poor tap is worn out, perhaps I shall be wasted."



A WET DAY

LESSON XLIX.

HARDY GOES INTO THE EARTH
AND OUT AGAIN.

drain'-age	pass'-a-ges	ques'-tion-ed	jour'-ney
u'-ni-ty	sand'-stone	di-rec'-tion	spark'-led
strength	thith'-er	urg'-ed	dis-sol'-ved
should'-er	parch'-ed	glor'-i-ous	pres'-ent-ly

1. "Be comforted, my sister," said Hardy; "I have learnt that water is never wasted. You and I are going together down a narrow pipe, but we shall soon come to larger pipes, and join many another drainage stream. At last we shall reach the river, and thence float to our home in the sea.

"The water we leave behind us will do its useful work, and most of it will follow us; soapy and dirty, perhaps, but still flowing."

2. "You do indeed comfort me, brother; but will you not tell us what became of you after your body splashed on the earth?"

"I am thankful to say I was not alone. 'Unity is strength,' they say, and we drops have quite proved that it is so.

"We could not go back, and so, shoulder to shoulder, we broken rain drops pushed forward, making our own passages through

the upper soil, even through some sand-stone rocks, until we met again in an underground pool.

3. "We did not all reach the pool, for on the way thither the parched roots of plants sucked up the water which came within reach of their eager mouths.

4. "To return to myself, I say we met in a pool and questioned each other as to why we waited there.

"Those who had arrived before us said it was because the ground below was clay, and too close grained to let us pass, but we did not give up trying to go through all the same. We even bent the hard clay into a hollow basin with our weight, but it was too strong for us; it would not let us pass through.

5. "What were we to do? We did not want to stay where we were, we wanted to get back to Old Ocean.

"At last there came to us a feeling that if we could not get further *down*, we might make our way in another direction. I was amongst the first to find that pushing between the clay and the soil was not so very difficult, and once on the way there was no stopping, for those behind urged us onward.

6. "It was a grand and glorious day when our journey in the dark came to an



A SPRING ISSUING FROM A HILLSIDE

end, and we beheld the sun, and felt the breath of the wind once more.

"We sparkled, and we danced, and rippled

over stones, and called ourselves a rill or brook, and our opening on the hillside we called a **spring**.

"On our way through the earth we lost all our softness. You see we had such hard work to get through.

7. "On the hillside we soon met with other brooks, and went merrily along, getting deeper and wider with every fresh stream that joined ours, and presently we were quite big enough to be called a **river**, and we had great hopes of soon being at home.

"Alas, for my hopes, the river flowed beside a great town."

LESSON L.

HARDY GOES TO TOWN.

re'-ser-voirs	grav'-el	dis-solve'	bubb'-les
fil'-ter-ed	con'-stant-ly	trav'-ell-ed	re-mem'-ber
gurg'-ling	im'-pure	spark'-le	es-cape'
sneer'-ing	car-bon'-ic-acid	ea'-si-ly	pur'-pos-es
vess'-el	o-pin'-ion	draught	con-fess'

1. "I must tell you that the river was there long before the town; in fact, the town grew partly *because* there was a river,

"People use a great deal of water. Our beautiful river made them think. 'Here is what we want, here let us live.' They made

for themselves large water-holders, and filled them from the river.

2. "I tried hard to escape being caught, but after all I was forced to run through a pipe into one of their tanks or reservoirs to be filtered. I could not help gurgling when I heard No. 2 praising my brightness, and sneering at sister Softly being strained through a flannel.

"She little thought that her sparkling pipe water had been strained, or filtered, through beds of gravel at great cost and much work.

3. "I suppose I am as clear from bits and from smoke as any town water can be, but after all their trouble, I am still far from being as pure as I was when I first left the ocean."

"Why, brother Hardy," exclaimed Softly, "you look so beautiful, and are so constantly used for cooking food, and for drinking purposes, that I cannot think of you as being impure."

4. "Thank you for your good opinion, sister; but what, think you, makes me *hard*? I will tell you.

"When I was in the earth, I took into myself some of the rock—not a great deal of course, but enough to spoil my purity.

"Just to show how one thing leads to another, I will confess to having taken a little draught of gas on my way from the clouds to the earth.

5. "We all did the same; every drop of us had just a little carbonic acid gas within us, and it was the gas which enabled us to dissolve the stone and get along; but then the gas and the dissolved stone travelled with us, some in each drop, and not even the filter beds have removed them."

6. "And can you never be rid of these two things within you, brother?"

"Oh yes, easily enough, but then I lose my sparkle, and am flat to the taste. All that is required is to drive off the gas, and then I can no longer hide the stone. The very kettle used in this house is lined with stone which I carried from the rocks miles away from here."

7. "How can the gas be driven off?" asked Softly.

"By boiling the water," replied Hardy. "The gas will come to the top in bubbles, the bubbles will burst, the gas will escape, the stone will sink down, and the water will be soft."

Remember boiled water is soft water. The very purest water is **distilled**.

LESSON LI.

TRAP No. 2 SUMS UP.

trou'-ble	dumb	ques'-tion	greas'-y
ex-pense'	a-maze'-ment	leak'-age	tow'-el
cheer'-ed	grav'-el	plumb'-er	poss'-i-ble

1. "I wonder why I am wanted, when it is so easy to make my brother into soft water," said Softly.

"There is nothing to wonder at," replied Tap No. 1. "You are nice and soft without trouble and expense, but if hard water has to be made soft, it costs something for fires, besides the trouble."

In this way, and by thoughts of her own usefulness, Softly was cheered. She remarked that she had not heard No. 2 say a word for a long time.

"No," said No. 2, "I have been dumb with amazement. I feel how little I know, but thanks to you two, I am trying to understand something about both of you. You are so different and yet so much alike.

"You have both been in the ocean, where you were impure and hard; you have both been in the clouds, where you were nearly pure and soft; you have both been changed from vapour into water again, and you both

tried to get back to the sea, and started to run there as soft water drops.

2. "On your way you were both caught; one in a little house-tank, and the other in a big town-tank. One of you is filtered through flannel here under our very noses, and the other is filtered through gravel-beds a few miles away. Dear me, what wonders!"

3. "The next question is, will these two little streams from your door and mine ever reach the ocean," said No. 1.

"We'll make a good try," said Hardy and Softly together, as they pushed the doors of No. 1 and No. 2 a little wider open, and flowed a little stronger down the drain together.

4. Next morning, Mrs. Moore exclaimed, "Goodness me, whoever can have left these taps running?" Then she tried to screw them both a little tighter, but she could not stop the leakage, so she sent for the plumber and paid him 2s. to fit a new washer, or pad, on each of the taps. Clara was at home while the plumber was at work, and of course asked some questions.

5. "I shall have to pay a fine to the Waterworks Company," her mother explained, "if I waste the hard water; and for my own sake I cannot afford to lose the next

rain water, though I have lost what was in the cistern yesterday."

6. "Shall you wait until it rains again before washing the clothes, mother?"

"No, my child, though I almost feel inclined to do so; but it is not right to keep dirty clothes in the house. The greasy dirt that collects upon towels, and upon our own bed and body linen, ought to be got rid of as soon as possible."

LESSON LII.

WHY CLOTHES SHOULD NOT REMAIN DIRTY FOR LONG.

un'-wash-ed	pro-vi'-ded	un-der-stand
col-lect'-ed	sur'-face	dis-a-gree'-a-ble
sweat	mi'-cro-scope	po'-sy
per-spir-a'-tion	an'-i-mal	e-spe'-cial-ly

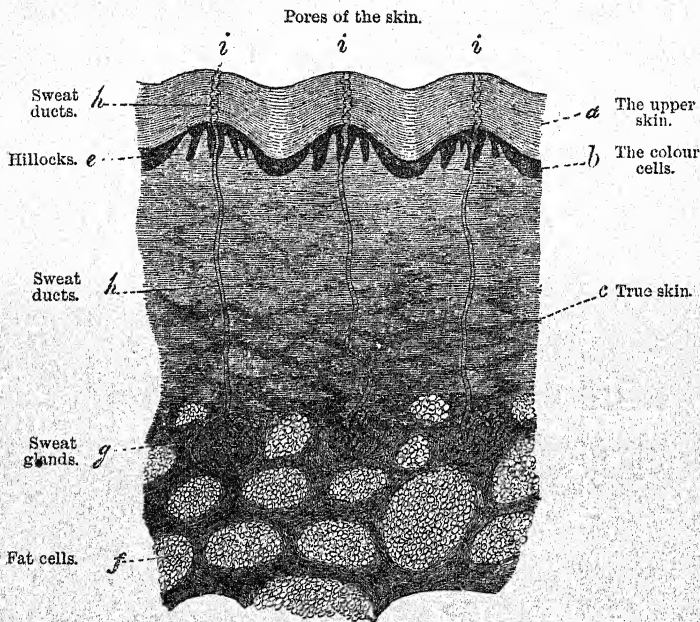
1. "Please, mother, tell me what you meant when you said, 'Greasy dirt collected on our bed and body linen.' Surely we don't wear greasy clothes, nor lie between greasy sheets."

2. "Has my little girl forgotten why we ought to wear woollen clothes next the skin?"

"No, mother, I recollect that they keep our bodily heat near to us, and also soak up our sweat."

"Now you must try to remember, dear,

that perspiration, or sweat, is not pure water, but is water which contains a great deal of waste matter from our bodies, and this is of a greasy nature.



VERTICAL SECTION OF THE SKIN
(Magnified 20 Diameters)

"We should soon be ill if the waste were not carried away, so our skin is provided with millions of tiny pipes opening on the surface."

3. "Why, mother, I have seen some skin through a microscope, and Miss Lowe showed

us a picture of it, too. We were having a lesson about hair, and in the picture the little oil-bags that make our hair soft and shiny, and help to keep our skin soft, were as plain as could be. Of course Miss Lowe told us that the picture was drawn hundreds of times bigger than the real skin, so that we might easily see how skin is formed."

4. "Well, Clara, since you have seen the sweat-pipes, and have been told that they carry away animal waste, you will easily understand that the dirt which gets on our clothing is of a greasy nature, and whether silk, wool, cotton, or linen be worn, the sooner the dirt is all washed away the better. Besides, dirty clothes have a disagreeable smell, but fresh washed, well washed linen is as sweet as a posy."

5. "Mother, why don't you have the washing done on Monday?"

"Because I think Tuesday is the better day for the work.

"What day comes before Monday, Clara?"

"Sunday, of course," Clara answered, "and then we have all clean things on, so most of the dirty clothes are in the baskets before Monday morning."

6. "That is true, Clara; but we keep Sunday as a day of rest as much as we can, and

that gives a little more sweeping and dusting to be done on Monday, especially if there is an extra fire, as there often is on Sunday.

"Besides the extra housework, the Sunday clothes must be brushed and carefully folded and put away. Monday is a very busy day."

LESSON LIII.

TUESDAY FOR WASHING-DAY.

Tues'-day	rub'-bing	shrink	poss'-i-ble
choos'-ing	grand'-moth-er	cleanse	guess'-ed
reas'-on-a-ble	wrist'-bands	sev'-er-al	ging'-ham
mar'-ried	mag'-ic	squeez'-ed	soap'-y

1. "The best of all reasons for choosing Tuesday is because most of the clothes would say 'Tuesday, if you please,' if they were asked, and could speak."

"Now that is funny," said Clara.

"Not so funny as it sounds, but quite reasonable," replied Mrs. Moore. "I found out quite by chance many years ago what the clothes wanted."

2. "Tell me about it, mother."

"It was when I was first married. I chose Monday for the washing day, and at the end of each wash I was quite tired out. My hands were sore with rubbing, and instead of a tidy house, I used to hope that no one would come and see me on that day.

3. "One Monday just as the washing was begun, I had to go to see your grandmother, who had been taken ill. I kept wishing all day that my clothes had never been wetted. However, next day, I wrung the clothes out of the water I had left them in, and put them into some fresh, hot, soapy water.

"When I began to rub the collars, neck-bands, and wrist-bands, and other dirty parts, I found that the dirt seemed to slip out as if by magic.

"'Oh,' thought I, 'I've learnt a lesson. No more washing without soaking.' I had scarcely any hard rubbing to do.

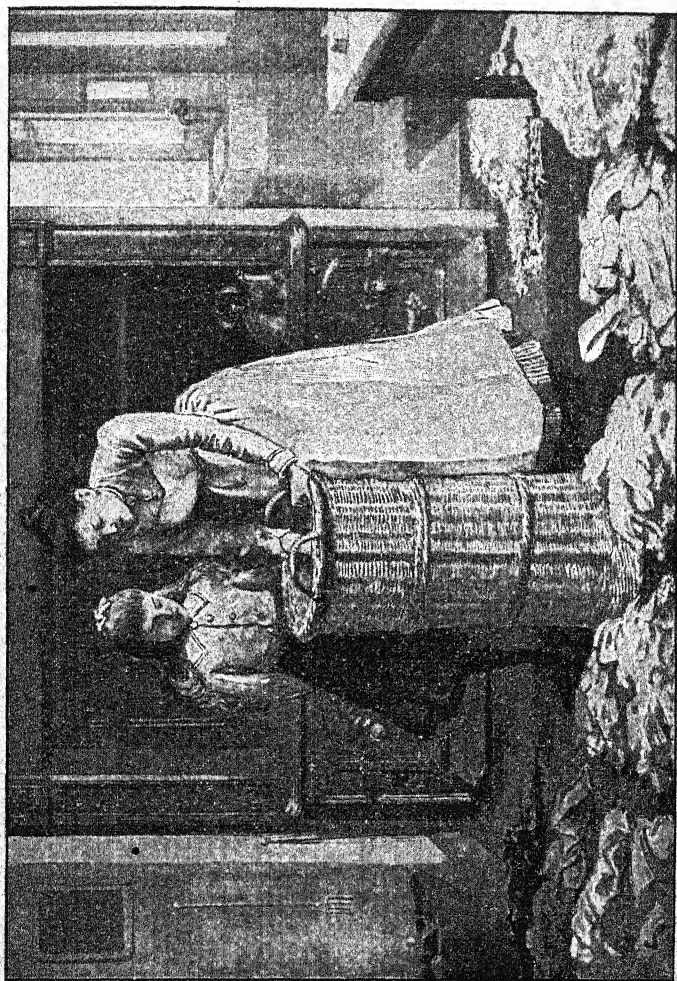
4. "As I did not mean to soak clothes on Sunday, I changed my washing day to Tuesday, and I have kept to Tuesday ever since, though I soak all but the flannels, prints, and coloured clothes on Monday."

5. "Why don't you soak flannels, mother?"

"If flannels are soaked, rubbed, or boiled they shrink and become stiff."

"Oh yes, I remember that wool fibres are different from other fibres; they are curly, and have zig-zag joints."

"These joints," said Mrs. Moore, "catch and hold fast to one another when flannel is rubbed, and then we say, 'Look, this garment has become too small to wear.'



SORTING THE CLOTHES

6. "We must neither soak, nor rub, nor wring flannels, but cleanse them by moving them about in several changes of warm, but not hot, soapy water. Then they should be squeezed and dried in the open air as quickly as possible."

7. "I can guess why prints and coloured clothes are not soaked; it is because the dye comes out and gets into places where it is not wanted," said Clara.

"Your guess is right, Clara; but there are some coloured materials, such as gingham and Oxford shirting, which will bear both soaking and boiling, but these are not printed, their threads are dyed while yarn, with fast colours."

LESSON* LIV.

PREPARING FOR THE WASH.

pre-pare'	mean'-while	car-bon'-ic	coars'-er
there'-fore	curd-like	con-sist'-ed	stock'-ings
fur'-nace	mix'-ture	con-tain'-ed	re-quire'

1. The next Monday, Clara helped her mother to prepare for the Tuesday washing.

No rain had fallen. Mrs. Moore therefore filled the copper with hard water; then she made a fire under, and fed it with slack and small coal. (The furnace-fire burnt up coal that was too small for the house-fire.)

2. Meanwhile Clara shred a pound of soap



SOAKING CLOTHES

with an old knife. "I should not want half that soap to be cut up if the water were soft," said her mother, "but you must put all that in the copper, and while it is melting and the water is coming to the boil, we can do some other Monday work."

3. When Mrs. Moore took the copper lid off, Clara saw that the top of the water was covered with a curd-like cake.

"What is it?" asked Clara.

"It is a mixture of lime and soap," her mother answered.

4. "Did you put the lime in, mother?"

"No; the lime was in, but unseen. When the carbonic acid gas that helped to hide it was sent off, the lime went at once into some of the soap and spoilt it; but while the lime was spoiling some of the soap, it was caught and brought to the top of the water just ready to be taken off and thrown away, while the remaining soap makes the water soft enough and strong enough to soften the dirt in the clothes. We must remember to soak clothes in warm, not hot water."

Mrs. Moore and Clara then gathered together all the things that were to be washed.

5. "Now sorting must be done.

"You had better look on while I do it," said Mrs. Moore.

Soon there were twelve small lots of things instead of one big heap. Lot No. 1 consisted of lace and fine muslin things; lot 2 were curtains and window blinds; No. 3 were collars, cuffs, fronts, and white shirts. In lot No. 4 there were table linen and toilet covers, and in No. 5 handkerchiefs.

6. The 6th heap consisted of bed and body linen and bedroom towels, and in the 7th were holland aprons, glass-cloths, and tea towels; while group 8 contained coarser kitchen towels, aprons, and dusters. Other rubbing cloths formed lot No. 9. Woollen shirts, vests and pants, were put together in group 10. Stockings formed group 11, and the 12th and last contained those coloured articles which must not be soaked.

7. "Three of these groups will require one extra water. Can you guess which they are, my dear?"

LESSON LV.

SOAKING THE CLOTHES IN GROUPS.

care'-full-y	partic'-u-lar	se'-pa-rate-ly	us'-u-al
hand'-ker-chief	col'-our-ed	dirt'-i-est	reas'-on
cur'-tains	art'-i-cle	iron-mould	so'-da

1. Clara looked carefully over the groups and then said, "The stockings will be one

set, and next to them I should think the handkerchiefs, but I cannot tell which other set will want more washing than the rest."

"You are right so far, Clara, for the stockings will be soaked a little and the foot part of them will be rubbed, although they are made of wool. The handkerchiefs will be kept to themselves in a first and second water, but after that they may be put with the fine things.

2. "The curtains and blinds are the set you did not think about. It would never do to put them with the other white clothes in the soaking tub until they had been shaken and passed through clear warm water, to get out some of the smoke and dust, which they always gather in a smoky town. While I make the curtains ready, Clara, you can put the woollen and coloured things into a basket till morning. Mrs. Lomass will wash them the first thing, so that they will be drying in the morning air."

"But, mother, if the clothes are going to soak together, why are you sorting them?"

3. "If I were not very particular about the sorting, Clara, I should soon have the clothes a bad colour.

"You will see me wet each article separately, and lay them down in the dolly-tub in

groups, beginning with the lowest group, 9. Then I shall wet and lay down group 8, and so on until the fine things are at the top and ready for Mrs. Lomass to wash first."

"I see now, mother, the reason of the sorting; the dirtiest are at the bottom, and will be washed last."

4. Whilst Mrs. Moore was talking she was also at work, and soon all the wet clothes were in soak, and the copper was wiped dry.

"If we leave the copper wet," she said, "I dare say it will be rusty by to-morrow, and then there will be spots of iron-mould on the clothes. For fear of iron-mould, I always boil the fine white linen in a bag."

5. When Mrs. Lomass was told the next morning about the lost rain water, she said, "I feel sorry for my poor hands, for I shall, of course, have to use soda."

"I don't think you will," said Mrs. Moore; "you must use more soap than usual, and be careful to rinse it all out too."

"Oh yes'm, I know that if the rinsing is not well done, the clothes will turn yellow; but that's where the blue bag comes in useful to make them white."



BLUE BAG

LESSON LVI.

SOAP, SODA, AND POTASH.

ques'-tion	al'-ter-ed	al'-ka-li	min'-er-al
u'-ni-on	bi'-ting	crys'-tals	pro-duc'-tion
dis-cov'-er-ed	ac-quaint'-ance	ac-cord'-ing	ex-act'-ly
sea'-weeds	dis-cov'-er-y	ve'-ge-ta-ble	li'-quid

1. "Mother," said Clara, "can you tell me what Mrs. Lomass meant when she said, "Clothes turned yellow, and blue made them white?"

"It will take me some time to fully explain, Clara, but come with me into the sitting-room and we can then talk about it.

"I will first ask you a question, Clara. Do you know what soap is?"

Clara thought awhile, and then replied, "I only know that soap is soap."

"Well, my dear, try to remember this: soap is a substance made by the union of fat with soda or potash."

2. Clara repeated this several times. Then her mother said: "You do not know what either soda or potash are, so I will tell you.

"Once upon a time, long ago, some one discovered that hard water became very much altered if allowed to stand awhile on the burnt ashes of plants and seaweeds (named alkalies, because they were roasted).

Hard water became soft, but not soft like rain water; it had a biting, salty taste, and if any one washed themselves in it, it made their skin rough; but if dirty and greasy clothes were soaked in it, the grease quickly mingled with its new acquaintance, carrying other dirt with it.



LUMPS OF SODA

3. "After this discovery, people used to prepare for washing day by burning alkali plants and covering them with water, and this they called 'setting the lye.' Then by using 'lye,' dirty clothes were easily cleansed.

"Alkali, the name of the plant, was also given to that which came out of its ashes into water; but the alkali in the water was unseen, in the same way that sugar or salt are often unseen in liquid.



SODA JAR

4. "However, some one found out how to send the water away as steam, and when it was all gone, there were crystals left. These were named soda, or potash, according to the plants they came from. Now people no longer 'set

the lye,' because they can easily and cheaply buy 'Soda.'

5. "When soda and potash were both obtained from plants, they were both vegetable productions; but now all the soda we use is made from common salt, and as salt is a mineral, soda is a mineral production. Yet it has exactly the same character as if it came from an alkali plant, and is therefore still called an alkali.

6. "I told you, Clara, that alkali quickly unites with animal fat, but when fat and alkali are united, a new substance is formed which is neither alkali nor fat, but is the common thing we use every day which we call soap."

LESSON LVII.

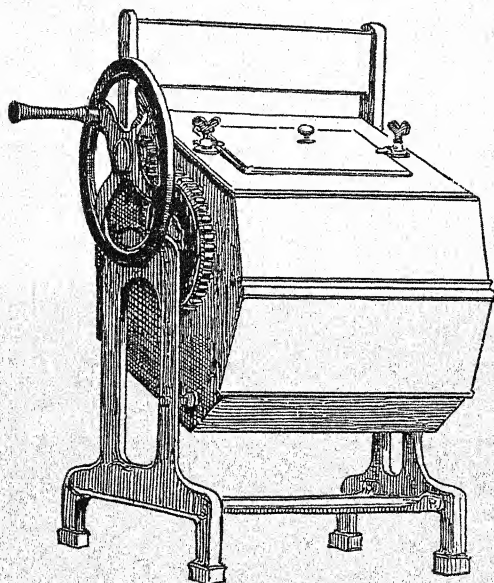
SOAP-MAKING AND THE BLUE BAG.

tal'-low	grad'-u-al-ly	ding'-y
man-u-fac'-tur-er	house'-hold	wring'-ing
sol'-id	sub'-stan-ces	ma-chine'
im-mense'	veg'-et-a-ble	washer-women
cor-rod'-ing	col'-our-less	wrapp'-er
dis-solv'-ed	chalk'-y	

1. "The soap manufacturer gets his tallow from the same countries which provide us with hides for leather. Russia is one of our chief tallow markets.

The solid fats are changed into a liquid state by boiling in large vessels.

2. "While the fat is boiling, strong soda dissolved in water is gradually added. The mixture is kept stirred. It thickens, and at last liquid soap is formed. This is ladled

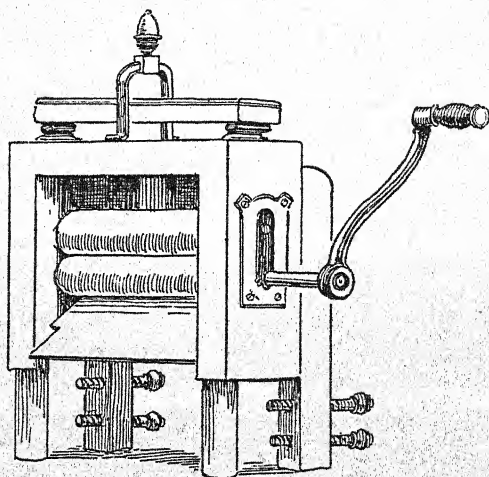


A WASHING MACHINE

out into moulds, and when cold and dry it is ready to be sold for our use.

"When soap has more alkali in it than the fat can well unite with, it will injure the skin, and should not be used either to wash ourselves, or for household work, or for washing clothes.

3. "Besides corroding animal substances, alkalies attack vegetable fibres and begin to use them up, making them very tender and easily worn out, and changing their colour to a yellowish white.



A WRINGING MACHINE

"Now this brings us back to what Mrs. Lomass meant when she said that soap made the clothes yellow.

"You see it is the alkali that is in the soap that must be well washed away with the rinse waters."

4. "But what about the blue bag, mother?"

"Why, Clara, my dear, though white is not a colour, and things white are said to be



"MAY I TURN THE HANDLE OF THE WRINGING-MACHINE, MOTHER?"

colourless, yet we talk about creamy white, pinky white, milky white, bluey white, chalky white, and so on.

“Now the clearest, brightest white has a faint blue tinge, and this is why blue is put into the last rinse water; but if too much is used, or if the clothes are badly washed before being blued, they take a dingy shade of whiteness.

5. “I often attend to the blue rinsing myself, Clara, and I am going now to see if Mrs. Lomass has any clothes ready for me to finish. You may come and see it done if you like.”

6. “May I turn the handle of the wringing machine, mother?”

“Yes, you may, then you can watch how I fold the clothes so that they are evenly pressed by the rollers, and how I cover the buttons, so that they neither get broken nor cut holes in the garments. You may notice too how I take care not to drag the articles from under the rollers as so many careless washerwomen do.

7. “But first let me get some fresh blue.”

“What a lovely colour,” said Clara, as she saw a new square of blue taken from its paper wrapper and tied up in a piece of flannel.

LESSON LVIII.

BLUE: INDIGO-BLUE.

earth'y	Ind'i-a	bruise'd	sprink'le
in'-di-go	Thib'-et	steep'-ed	poss'-i-ble
ob-tain'-ed	cul'-ti-va-ted	laun'-dress	thor'-ough

1. "Is blue made of chalk, mother?"

"No, Clara, it is not an earthy substance at all, though it does look a good deal like chalk, and powders the fingers when touched, as chalk does."

2. "What is it then?" Clara asked.

"Its full name is Indigo-Blue, and its name tells us that it is a blue substance obtained from a plant called Indigo, which grows in India, Egypt, Thibet, and America.

"The plant is cultivated because, when bruised and beaten and steeped in vats of water, it gives out a beautiful dye, which settles at the bottom of the vats and is then dried and sold as you see it.

3. "Indigo-blue is even more useful to the painter, the printer, and the dyer than it is to the laundress.

"Come, let us use the blue we have here, and afterwards you and I will hang the clothes out to dry.

4. "There is plenty to be done to keep the

things about the house, and our clothing sweet and clean, and there is always something for you to learn."

"Yes, mother, let me see what I have learnt about washing.

"We sorted and soaked yesterday, then Mrs. Lomass washed each article twice. She rubbed the dirty part with soap, and in the second water each garment was turned the wrong side out. After that they were boiled, and then twice rinsed without soap, the last time in blue water, and then they were done."

5. "Done being washed, but not finished yet," said Mrs. Moore, "for after washing they have to be dried, and after drying damping is done."

"Why are they dried and then damped, mother?"

"Thorough drying in the air keeps the clothes a good colour, and makes them sweet to smell, but when very dry they will be rough, and as we want them smooth we sprinkle drops of clean water upon them, and fold them tightly and evenly, and leave them for a few hours to become evenly damp but not wet.

6. "Then mangling, or ironing, will make them smooth to the touch, and after airing off and mending they will be ready to be worn again.



HANGING THE CLOTHES OUT TO DRY

"Let me just tell you, Clara, that the first drying should be in the open air if possible, but it is best to 'air off' before a good fire."

7. "May I make the starch, mother?"

"Yes, you made it nicely last week."

Clara was careful to damp the dry starch with a little cold water and braid it smooth with the back of a spoon; then she added a slight tinge of blue, and just as the water boiled she poured it on to the starch paste, stirring all the time.

8. It was always a wonder to Clara how the white milky raw starch came to be such a clear jelly, though she knew it was because the starch grains burst when they were cooked.

Mrs. Moore now stirred the starch with a little white wax, to keep the iron from sticking and to produce a gloss on the linen.

9. "When shall I begin to do the ironing, mother?" Clara asked.

"You may iron the handkerchiefs to-day, my dear. When you are a little older you shall try your hand on something more difficult."

APPENDIX.

SUMMARIES OF LESSONS.

LESSON I

Move with care ; have no needless holes in clothing.

Learn to mend as soon as possible. A good mender has neat and tidy habits.

Mend worn or torn places as soon as they are found out. A small patch or darn is easier to do, looks better, and takes less time than a large one.

Save pieces of stuff like the garments. Pretty patch-work covers and quilts can be made with the new material if any is left over when the garment is quite worn out.

Every girl should have a workbox or basket, containing thimble, scissors, tape-measure, needles, pins, buttons and hooks and eyes, sewing cottons, silks and threads.

LESSON II

The right way of stuff according to weaving, fixes the selvedge lengthwise up and down, not round the dress.

The right way according to pattern, fixes the patch so that sprays or scrolls seem to run up, not down the dress. Children should practise matching.

While fixing a patch, a flat table should support the garment. The torn edges should be lightly drawn together with stitches that can afterwards be taken out.

The size of the needle wanted depends on the material. Calico requires finer needles than woollen goods.

LESSON III

Needles (and most manufactured articles) are now made by many hands instead of by one person.

Time is saved and a perfect article obtained by this

changing of hands, because each workman learns to do well and do quickly his portion of the work.

The work of needle-making begins with mining the ore; smelting to separate the metal from earth; puddling and refining, and steel making; steel wire drawing.

Long Crendon is the chief town in which knitting needles are made.

A gauge is a measure. Wire is gauged by its thickness.

LESSONS IV AND V

Processes of needle-making :—

- (1) Cutting the roll into lengths for two needles.
- (2) Straightening the lengths.
- (3) Pointing at each end of length.
- (4) Washing and drying the lengths.
- (5) Heading by flattening the middle of each length.
- (6) Cutting the lengths into two needles.
- (7) Eyeing each needle.
- (8) Trimming the inside of the eyes.
- (9) Grooving the heads.
- (10) Trimming the heads outside.
- (11) Tempering the needles.
- (12) Polishing the needles.

After these processes the needles are made ready to be sold in packets or cases.

The story of Aunt Jane's needle is true.

LESSON VI

Flint stone is very hard and heavy, and when split it takes a kind of shell shape, with smooth bright surface and sharp edges.

These qualities made flint of great use in olden times. Needles, knives, choppers, scrapers and other flint tools are sometimes found in the caves wherein our forefathers dwelt.

Flint stones are found in rounded lumps in chalk rocks. This shows that the sharp edges have been worn away by water and the chalk has settled and dried around them.

LESSON VII

Mankind has no natural covering of the body except the hair of the head. This is an advantage, as it enables us to dress in clothing suitable for all lands and climates, and we can live in other parts of the world besides that in which we were born.

We **need** to wear clothes for **protection** from sun, from rains, from frosts and snow, from burning or chilling winds, from cutting stones, from prickly scratching plants, and from biting and stinging insects.

We **need** to wear clothing to help to keep our bodily heat at the right level.

Besides the need for clothing, mankind wears clothing for **adornment**, while, in all civilised lands, people dress because it is right and proper to do so.

LESSONS VIII, IX, AND X

Our bodies are kept alive and in working order by food which changes partly into body material and partly into heat. That which changes into heat enables the organs to go on working.

A fresh supply of food should be eaten at regular times.

After a meal, the digested food is taken to the heart and thence to the lungs where that part of it which makes heat unites with the air **breathed in**, and is consumed.

Bodily heat will be 98 degrees in a healthy body, when measured by a thermometer.

Thermometer is a word which means heat-measurer. Remember the new word if you can, but be sure you remember the simple words it stands for.

If there were no heat within the body, no amount of clothing would make us feel warm.

LESSON XI

Sun heat, fire heat, and bodily heat are the chief sources from which we get heat at all.

Heat moves from the sun, the fire, and the body in lines or rays, and the movement we name **Radiation**.

Our clothes keep bodily heat from radiating too quickly.

Sun or fire heat rays pass into the air and the air breaks them up and mingles itself with them. This is called **Diffusion**. Diffused air is better for us than unbroken rays would be. Bread is toasted and meat is cooked before a fire by almost unbroken rays; but when the same rays are diffused by the air in the rooms, we feel a comfortable warmth from them.

When heat touches substances it travels through them by a movement called **Conduction**. Things through which heat moves quickly are good conductors, and those through which it goes slowly are bad conductors.

LESSONS XII, XIII, AND XIV

How a Magic Lantern can help us to Know

People who cannot leave their own country ought to gain knowledge about people of other lands by reading what travellers have written. Pictures are so true now that the sun makes photographs for us, that pictures alone will teach us much about the dress, habits, and work of people other than ourselves.

The more we know, the less likely we are to think too much of ourselves and too little of others. If we find something painful in the sight of a deformed foot, we ought to find as much to be sorry for in a deformed body.

What could be more absurd to the eyes of an Eastern lady than a fashionably-dressed European lady, who is con-

sidered in "full dress" when her neck, shoulders and arms are bare, and half the length of her dress is sweeping the floor.

Dress in every land ought to be in shape suitable to the human shape, and capable of protecting weak parts; in material suitable to the climate, and in quality suitable to the work the wearer has to perform.

LESSON XV

A quick temper is not always a bad temper, if followed by a speedy return to a right state of feeling.

Children have a good deal to learn before they know more than their parents, but a real student may, in time, teach all the world something worth knowing.

Good, honest work, however dirty or disagreeable, is no cause for shame.

LESSON XVI

A knowledge of science has helped to change the way of making many things.

Within the last seventy years the science of Chemistry has completely changed the method of tanning leather.

The discoverer of the tan liquor method at first failed because he used too strong ooze, and the ooze acted so quickly that the outside of the leather skin became tanned before the inside was touched, and this "case-hardened" leather could never be of any use.

A second failure happened by forcing the ooze too quickly through the gelatine. This produced porous leather, which of course is no use for keeping the feet dry in wet weather.

Ooze is now used of gradually increasing strength.

New and improved machinery also helps to make good and cheap leather.

LESSONS XVII AND XVIII

The making of leather is easily arranged under three headings, viz.: (1) Preparing for the tan; (2) Tanning; (3) Finishing.

The preparation processes are: Sorting, sweating, soaking, unhairing, fleshing, rounding, raising.

The tanning processes are: Making the ooze, handling (in seven or eight pits, in five of which the skins are turned over twice a day), feeding, *i.e.* resting in layers between which there are layers of ground bark.

The finishing processes are: Washing, brushing, draining, striking, scouring, oiling, drying, samming, and lastly rolling.

LESSONS XIX TO XXIV—SILK

England is not a good silk-growing country, because success depends upon having healthy insects and enough of the right sort of food. The silkworm could not bear our climate, and mulberry-trees are not grown in large numbers.

Silkworms are natives of China, Japan, and India. The worm from China is now cultivated in Italy and Southern France.

In olden times China was known by the name of Seres, and the word *Silk* simply meant "stuff from China."

An ounce of silkworms' eggs (or silk seeds as they are called) produces over 40,000 worms. The common silkworm produces excellent yellow silk; another variety produces very good white silk.

Silk fibre is the strongest, brightest, and richest of all fibres; it will stretch as much as a tenth of its own length without breaking; example, 100 feet of fibre will break when stretched to 113 feet.

From 600 to 1500 yards of fibre are wound into an egg-shaped cocoon. In the cocoon the worm becomes first a pupa or chrysalis, and next a perfect moth, whose real name is *Bombyx mori*.

This fibrous covering is formed as a liquid in glands folded down each side of the worm. It is stored in a straight pipe and poured through two ducts (one from each side) into the main duct, and thence to the open air. The single fibre is called Brin. The two Brins together, as it issues from the main duct, is called Bave. Raw silk is obtained by reeling two or three single baves together.

Brin has an inner and outer portion, the outer being about a quarter of the quantity of the whole; and as the same quantity is lost in the process of "boiling off," it proves that the outer portion is silk glue, or "sericin."

Hot, soapy water completely removes the gum, and the fibre is left soft, lustrous, elastic, and strong.

Silk has the property of absorbing moisture in large quantities from the air without altering its appearance; quite a quarter of its weight can be absorbed. This fact should warn us against putting on silk neckties, gloves, or other garments which are not well aired.

Silk buyers and sellers always reckon that a certain amount of weight in silk is water.

- Besides the cultivated silkworm (*Bombyx mori*), there are other silken cocoon-making insects.

The Tussah moth produces a spinner which makes a bag-shaped cocoon of longer, coarser, and darker-coloured fibre than the mulberry silkworm.

The colour in the silkworm's fibre is in the glue, and can be boiled away, leaving the article ready to be dyed or bleached.

The colour in the Tussah silk is in the fibre itself, and will not readily bleach or dye.

LESSONS XXV TO XXXI—WOOL

Wool is the name given to some kinds of the natural covering of animals to distinguish it from hair or fur.

Wool fibre under a microscope always shows a notched surface, as if the whole length were made up of short lengths,

fitting cup-like one within another, each portion having jagged edges.

It is this formation which makes woollen goods easily become matted or felted.

Sometimes felting is done purposely by the cloth manufacturer, or by the hatter. Sometimes felting is done by the washerwoman, who knows that flannel garments and blankets "run up," *i.e.* shrink in the wash, but perhaps she does not know why they do so.

The best wool for cloth-making is long-stapled, curly sheep's wool.

The more nearly wool approaches hair, the silkier and smoother is the article made from it. (Compare alpaca and merino.)

Wool is a bad conductor of heat, and is therefore very suitable for making winter garments.

The processes wool undergoes in being made into textile fabrics are, briefly:—

Washing and shearing, done on the sheep farm ;
Sorting and packing in bales, done by the wool merchant ;
Sorting, washing, or cleaning ; combing or carding ; spinning and weaving, done by the manufacturer ;
Bleaching or dyeing is sometimes done before weaving, and sometimes afterwards.

Cloths must further be felted, teazled, nap cut evenly with a knife, and the surface hot-pressed on cylinders.

LESSON XXXIII (PART OF)—HANDIWORK

"Handiwork" is a term not much used now, but is one of our purest old words. It is spelt to-day very much as it used to be spelt by our forefathers. (Compare "hand-i-work" with "hand-ge-weorc). Both words mean **work done by the hand**. The word "manufacture" (made from two old Latin words) has very nearly the same meaning as "handiwork," namely (1) **making** by the hand, or (2) **things made** by the hand, and we still use "manufacture," though machines as well as hands are employed in making goods.

LESSONS XXXII TO XXXIX

Vegetable Fibres Used for Textile Fabrics.

The chief plant fibres for making woven goods are produced by flax, cotton, hemp, and jute.

The flax plant is a kind of herb which grows in temperate climates throughout the world, but is largely cultivated in Russia, Holland, Ireland, and America.

Flax is a valuable clothing material; its lustrous fibres are strong and jointed, but not scaly like wool, nor twisted like cotton.

Cotton trees and the cotton shrubs, which produce one of our most useful clothing materials, grow in very hot climates, and the latter are chiefly cultivated in the Southern States of North America, in India, and Egypt.

Cotton fibres are flat and twisted; they are soft, but have no lustre.

Hemp is grown in Central Asia, Russia, and Brazil, and in some of the hottest parts of Africa. Its coarse, strong fibres are used for making sacks, ropes, and coarse "hurden" aprons.

Jute is largely grown in India, and is much used for making some kinds of carpets.

Jute is often mixed with silk to make "silks" of poor quality, because its fibres will take brilliant dyes, but dyed jute fades quickly, and will not bear exposure to water or damp air.

LESSON XL

Lost time can never be regained. Put earnest thought into earnest work.

LESSONS XLI AND XLII

William Lee invented the stocking-knitting machine more than 300 years ago. Lee's framework knitting laid the foundation upon which a great industry has been built. Hosiery machines now knit a great variety of garments, and do more and better work than was formerly possible.

Framework knitters and loom weavers were often unable to go on working for want of yarn. About 140 years ago James Hargreaves and Richard Arkwright each invented a yarn-making machine, which would supply the yarn as fast as it was wanted. The best points in Hargreaves' "Spinning Jenny" and Arkwright's "Roller Spinner" were combined in a machine made by Samuel Crompton.

Crompton's "Mule Spinning Machine" is the one now in use.

LESSON XLIII

Steam or vapour is given off by water. Water occupying a certain space would fill 1700 times as much space if it were changed to vapour (water gas).

When liquid water is forced by heat to become steam the vessel which holds it must have an opening or it will burst.

The power of steam can be made useful by directing its efforts to escape from the vessel which contains it.

George Stephenson applied steam power to the spinning machinery at Arkwright's Cromford Mills. Steam power has also been used to drive machinery of all kinds.

The power of electricity has been discovered, and is now applied to many purposes. It is quickly taking the place of steam as a mover of (or motor for) machinery.

Thomas Edison, an American, will always be remembered as a great student of electricity and inventor of methods for using it. Mankind is now able to utilise this powerful force, and it will become of more and more service to us.

LESSON XLIV

Think about what you are taught. Learn to dress neatly and be tidy and careful with your clothes.

Do not be a slave to appearance or fashion, but wear what is right and suitable to your natural body, suitable to your income, and suitable for the work you are engaged in.

Be kind; remember that even a very much patched garment will keep some one warm for a while.

LESSONS XLV TO LI—WATER

Water is a fluid, but it takes a solid state, as ice, snow, or hail, at 32 degrees Fahrenheit, *i.e.* when measured by the thermometer. It also takes a gaseous state as the vapour in the atmosphere, or it can be forced into vapour by applying heat until 212 degrees Fahrenheit is reached.

Water is the most abundant substance in Nature, forming some part of every known thing. Except air, water is the most necessary thing for living beings.

Pure water is transparent, inodorous, tasteless, and colourless in small quantities, but blue, like the atmosphere, when in masses. Water is a bad conductor of heat and a good reflector and refractor of light. It has great power to dissolve things, and because of this is never found pure.

Even fresh fallen rain water contains carbonic acid and ammonia in small quantities.

Rain water is called soft water. Hard water contains salts, which it takes from the earth through which it passes. The more mineral impurities there are in water the harder it is.

Soft water dissolves soap better than hard, and is therefore best liked for washing, but hard water is far more pleasant to look at and to taste. Hard water can be made soft by boiling, and by the addition of soap and alkalies.

Pure water can be obtained from either soft or hard water by forcing the liquid to become vapour and then collecting the liquid which reforms when the vapour becomes cool.

Within the earth are reservoirs of water collected from rains.

Streams from these reservoirs find their way to the surface and form springs, which in turn form rivers.

The great natural reservoirs are the oceans, seas, and lakes. From these masses water is raised in a state of vapour, which is carried by the winds over the earth upon which it falls in the form of rain.

Water for the supply of towns is carried from a natural supply into artificial reservoirs, where it is purified and afterwards pumped through pipes to all parts of the town.

LESSON LII

Bodily waste is one of the most dangerous kinds of dirt; it is of an animal nature, and soon becomes offensive and an enemy to health.

Clothing upon which bodily waste collects needs to be often replaced by clean linen, and dirty garments ought not to be left unwashed for any length of time.

Plagues and fevers of many kinds arise through want of cleanliness. It is everybody's duty to do their part towards keeping themselves and their surroundings free from dirt.

LESSON LIII

Tuesday is the best washing day. Where there is only one pair of hands Monday's duties plus washing crowd too much work into one day. Even in those households where there is a person to attend to the washing alone Tuesday is the best day, because it allows for the soaking of calico and linen garments. Soaking saves time in washing, and also saves soap and labour.

Do not rub or wring flannels. A little salt in the last rinse water for prints will fix their colours.

LESSON LIV

Burn slack under the copper.

Shred soap with an old knife. Buy soap before it is wanted; cut it in pieces with a string, let it dry, and there will be less waste than if used while fresh and soft.

Prepare the soak water by boiling it with soap. Skim off the cap of lime which may have formed. Be particular about the sorting and the soaking.

LESSON LV

In soaking clothes give each group fresh water to start with. When each article in a group is wet lay down all together in a soaking tub.

Boilers not in use should be dried well. Boilers made of copper are likely to mark the clothes with a green coloured deposit called verdigris. Boilers made of iron may mark the linen with rust or iron mould.

LESSON LVI

Soap is a substance formed by the union of fat with an alkali.

An alkali is the soluble part of some plants and seaweed. The plants are roasted or burnt (hence the word alkali, which means "the roast") and covered with water, into which the alkali enters.

The most commonly used alkalies are Soda and Potash. All alkalies have the power of injuring animal and vegetable material, and all are soluble in water. Soda is now made from common salt.

LESSON LVII

Tallow is the fat of animals melted and made free from those parts which will not melt.

Pure tallow is white and almost tasteless, but the tallow which makes soap is of a somewhat lower quality.

Alkalies corrode or eat into, or wear away by degrees (as rust wears iron or steel away), the animal or vegetable matter they attack.

LESSON LVIII

A good deal of the mending required should be done before the articles are washed, but stocking darning, the replacing of buttons, and similar mending should be done afterwards.

When airing off take care that the clothes are not scorched.

Starch is enclosed in little woody cases, so tiny as to be unseen by the naked eye, yet so firm that the contents of

each grain remain untouched until great heat causes the covering to crack; then the starch soon takes in enough boiling water to swell out and become clear.

White wax is bleached bees-wax. Sometimes spermaceti is used.

Spermaceti is a clear, oily fluid found in the skull of the sperm whale. This oil sets and becomes a white, opaque substance when exposed to air.

THE END